FRUIT NOTES

Prepared by Pomology Staff, Department of Horticulture
Cooperative Extension Service, College of Agriculture
University of Massachusetts, Amherst

FEBRUARY 28, 1963

TABLE OF CONTENTS

Issued by the Cooperative Extension Service, A. A. Spielman, Dean and Director, in furtherance of the Acts of May 8 and June 30, 1914; University of Massachusetts, United States Department of Agriculture and County Extension Services cooperating.
Publication Approved by Alfred C. Holland, State Purchasing Agent, No. 44.

Bird Damage Research in Massachusetts

Investigations of bird damage to commercial fruit crops in Massachusetts were continued during this past summer. A review of past findings in this study resulted in the initiation of a different approach to this troublesome problem. Formerly research was directed at the testing of scare devices which would, if successful, give immediate relief. Now, however, it is thought that studies of the basic biology of the individual species involved will provide much of the badly needed information about behavior of depredating birds.

No entirely successful scare device has yet been developed. Firearms give immediate relief, but they require that the cropped area be regularly patrolled. Reflectors and scarecrows are ineffective. Firecrackers and exploders give temporary relief, but songbirds soon become accustomed to the noise and ignore it. Hawk and owl decoys give only temporary relief from bird depredation.

Total enclosure of areas, especially small cultivated blueberry plantings, has been the most satisfactory control measure to date. Such materials as tobacco cloth netting, nylon fish net, chicken wire, and netting made from twisted paper have been used for this purpose. They are all highly effective but are expensive to install.

A statewide fruit damage survey in 1962 showed a loss of 35 per cent of 157 acres of uncovered cultivated blueberries and a loss of 17 per cent of 220 acres of peaches. A similar survey in 1961 disclosed a loss of 37 per cent of 121 acres of blueberries and a 3 per cent loss of 148 acres of peaches. Surveys covering only cultivated blueberries for the years 1955-1958 have shown losses of 38 per cent, 20 per cent, 19 per cent, and 27 per cent respectively. If these surveys show a true picture of the bird damage situation then, we can assume that this heavy economic loss is stable, even though local areas may be more heavily damaged in some years than in others.

Five hundred and fifty-seven birds were banded at the University orchards during this past summer in order to trace bird movements. Two hundred and forty-two of these, including robins, blue jays, starlings and bronzed grackles, were marked with plastic-coated nylon wing tags for field identification. Some of them were marked with numbered tags for individual field identification. Local birdwatchers were then asked to report the sighting, location, species and date of all marked birds seen. By October 1, 1962, 152 individual sightings had been recorded. Several of these sightings were undoubtedly repeats for the same bird, as not all of the tags carried numbers and the numbered tags could not be identified in every instance. Only 3 of these sightings were outside a 3 mile radius of the orchard. This shows that the fruit damaging birds remained local for some time after being captured and released. Of notable significance is the fact that only 19 of the marked birds were subsequently recaptured in the University orchards even though intensive mist netting was carried out for the entire fruit season. An analysis of this data shows that even though the marked birds remained in the near vicinity of the orchards, most of them did not revisit the area after once being captured.

In view of the special attention given to individual species in behavioral studies the Baltimore oriole was considered separately. This species caused damage to all fruits in the University orchards, though principally to grapes and peaches. Because of their small size they were not marked for field identification. Consequently it was necessary to recapture banded individuals in order to learn of their movements. One hundred and forty-nine of these were captured, banded, and released. Seventy-five of these individuals were banded and released at a point 2.1 miles from the University orchard. Only 4 of these, or five per cent were subsequently recaptured in the orchard. In contrast 19 per cent, or 14 individuals of the control group or those released at the point of capture were again netted. Apparently the transporting of this species to a distant point before releasing had some effect on movements.

The Baltimore orioles tended to converge upon fruit in groups of from twenty to thirty individuals. The flocks were easily captured even though they were feeding in peach orchards several acres in extent because individual birds damage fruit on several trees on each visitation.

Future research will be given to the robin, the chief depredating species according to grower surveys and personal observations. A few of the questions which must be answered include:

1. How permanent, in relating to range, are the feeding habits developed by adult robins upon their arrival in the spring?

2. How far will young robins move from their nests to establish a feeding locality?

3. How do young robins establish a feeding locality?

4. Why will a field sometimes be heavily damaged in one year yet receive negligible damage the following year?

5. Why are the cultivated crops preferred when abundant crops of natural foods are readily available?

The knowledge gained from studies of individual species, including the principal fruit damaging birds: robins, starlings, blue jays, bronzed grackles and Baltimore orioles will be essential to any method of reducing damage to commercial fruit crops.

---Albert E. Hester, Graduate Assistant
Dept. of Forestry and Wildlife
Management

Fertilizer Recommendations for 1963

There will be no basic changes in recommendations this year compared to previous years. We are still of the opinion that adjusting nitrogen to the proper level which will produce the maximum yield of highly colored fruit of maximum storage life is the key to a successful orchard fertility program. It may take two or more years to determine the amount of nitrogen required to produce t desired level. This is especially true in those blocks which are too high in nitrogen.

In our fertilizer experiments, we have found that it may take two or more years for reduced rates of nitrogen to be effective. We have also found that omitting nitrogen applications from trees which were high in nitrogen did not significantly reduce yields below trees receiving normal rates of nitrogen. It appears that it may be necessary in some situations to omit nitrogen in order to bring nitrogen down to the desired level.

We are suggesting that growers should:

(1) Apply no more than normal rates of nitrogen.

(2) Omit or reduce nitrogen applications by one half in those blocks which have produced fruit with poor color.

Suggested rate of fertilizer for normal applications are given in the following table.

Normal Rates of Fertilizer for Bearing Apple Orchards

	Approximate Amounts per Tree					
Potential bushel yield of tree	Nitrogen required	Potash required	Ammonium Nitrate	Muriate of Potash or	0-15-30	8-16-16
	Pounds	Pounds	Pounds	Pounds	Pounds	Pounds
Less than 15	0.66	1.3	2.0	2.1	4.3	8
15 - 25	0.66-1.00	1.3-2.0	2.0-3.3	2.1-3.3	4.3-6.6	8-12
More than 25	1.33-2.00	2.7-4.3	4.0-6.0	4.5-7.9	9.0-14.3	16-25

The suggested amounts of materials to apply in the table are for hand applications under the spread of the branches. When the materials are broadcast over the entire orchard floor it may be necessary to increase the rate of application in order to obtain the same tree response as with the band applications. Fertilizer materials other than those given in the tables may be used so long as they are applied at rates which provide equivalent amounts of nitrogen and potassium.

The tree's magnesium and calcium requirements can best be met by maintaining an adequate dolomitic liming program. The pH of orchard soils should be maintained between 6 and 6.5. If a soil test shows that the pH of soil is 5.5 or below, magnesium sulfate sprays should be applied to prevent possible occurrence of magnesium deficiency. It takes from three to five years before dolomitic limestone is effective in correcting magnesium deficiency. When magnesium sulfate sprays are used apply two to three sprays of epsom salts at the rate of 20 pounds per 100 gallons of water. These sprays should be timed by calyx, first and second cover sprays. To avoid possible incompatibilities the epsom salt sprays should not be combined with the regular insecticidal and fungicidal sprays

Boron should be applied to orchard soils every three years. Borax is the most common material used. The rates of application per tree vary with age and size. Apply one-quarter pound of borax to young trees, one-half to three-quarters pound to medium age and size trees, and three-quarters to one pound to large or mature trees. Boron may be applied as a foliar spray on a trial basis. Polybor-2 or Boro Spray applied at one-half pound per 100 gallons of spray one and three weeks after petal fall have given satisfactory results in New York State.

The amounts of fertilizer applied to trees which have received annual applications of 200 pounds or more of hay mulch per tree may be materially reduced or entirely eliminated. Tree performance should serve as a guide in determining the extent to which the rates of fertilizer may be reduced.

In young, non-bearing orchards, it may be possible to produce sufficient high quality mulching material for the young trees by broadcasting 500 to 800 pounds of mixed fertilizer per acre. Place the mulch in a band under the spread of the branches. The amount of fertilizer required for the trees with this system of culture will vary with the quantity and quality of mulch applied around each tree. If the trees are not making sufficient growth, one-eighth pound of ammonium nitrate per year of tree age may be applied to the mulch.

Recommendations for fertilizing peach orchards are given in the following table. The amounts given may need to be increased if the trees are in a heavy sod. A suggested increase would be to double the amount of nitrogen.

Normal Rates of Fertilizer for Bearing Peach Orchards

	Approximate Amounts per Tree			
Tree Age	Ammonium Nitrate	Muriate of Potash or	0-15-30	8-16-16
	Pounds	Pounds	Pounds	Pounds
3 - 6	½-1	1-2	2- 4	2- 4
6 - 9	1 -1½	2-3	4- 6	4- 6
9 - 12	1½-2	3-4	6- 8	6- 8
12 & over	2 -4	4-8	8-12	8-16

---Walter D. Weeks

/ / / / / / / / / / / / / / / / / / / /

Extension Entomology Program --- Areas of Responsibility within the College of Agriculture Staff.

No single individual now has entire responsibility for the Extension program concerned with insects and their control and related subjects. Instead, several persons are listed officially as part-time extension and have accepted responsibilities for specific or general areas. Others, although not officially assigned to extension responsibilities, do assist in certain parts of the program. The following outline is provided for your convenience.

Staff Member	Areas of Responsibility
Headquarters at Amherst	
E. H. Wheeler	Dairy, Poultry, other Livestock and associated buildings etc., Forage crops, Tobacco --- all statewide. Vegetables and Potatoes --- Berkshire and Valley counties. Small fruits (except blueberries) --- Berkshire and Valley counties. Miscellaneous requests (except Apiculture). Pesticides in general. General coordination of Reports etc.
H. E. Wave	Tree Fruits --- statewide. Low-bush and Cultivated Blueberries --- Berkshire, Worcester and Valley counties.
F. R. Shaw	Bees and Beekeeping --- statewide.
Headquarters at Waltham	
W. D. Tunis	Floriculture --- statewide. Commercial Ornamental Horticulture --- statewide. Vegetables and Potatoes --- eastern counties. Cultivated Small Fruits (except cranberries) --- eastern counties. Coordination of Reports etc. from Waltham.
W. D. Whitcomb	Assistance in Tree Fruit, Small Fruit, Vegetable, Floriculture and Commercial Ornamental Horticulture programs --- eastern counties. Miscellaneous requests.
W. J. Garland	Miscellaneous requests and assistance in programs listed under W. D. Whitcomb.

A number of areas or commodities are not accounted for in the above listing. The following guide lines will be useful in these cases.

Cranberries --- handled entirely by Cranberry Experiment Station Staff. Prof. W. E. Tomlinson assists also in the programs for Cultivated Blueberries.

Forestry and Christmas Trees --- program in this area carried out in cooperation with W. B. Becker or the Experiment Station Staff at Amherst. J. H. Noyes, Extension Forester and the Bureau of Insect Pest Control, Department of Natural Resources and others. E. H. Wheeler will aid in general coordination where this may be helpful.

Mosquitoes, Ticks, Flies etc.(Pests affecting health, comfort and recreation)--- information available through staffs of the Department of Entomology and Plant Pathology at Amherst or entomologists at Waltham Field Station and Cranberry Experiment Station. Main responsibility assumed by E. H. Wheeler in cooperation with other personnel at Amherst and Waltham and associated with the State Reclamation Board and several Mosquito Control Projects.

Shade Trees and Related Municipal Problems --- information available through staffs of the Department of Entomology and Plant Pathology, (especially the Shade Tree Laboratory) or entomologists at Waltham Field Station, particularly C. S. Chater.

Structural and Other Home and Home Grounds Pest Problems --- joint responsibility of staffs in entomology at Amherst, Waltham and East Wareham. E. H. Wheeler will assist the general coordination of the program where helpful.

---E. H. Wheeler
Professor of Entomology

/ / / / / / / / / / / / / / / / /

STRAWBERRY PLANTING TIME

It will soon be time to plant many things including strawberries. The standard practice in New England has been and still is to dig and set the plants as early in the spring as the soil can be worked. Delaying the planting almost always results in a reduced crop no matter how carefully the plants are handled. Even if they are dug in very early spring and held in cold storage, the later the plants are set, the smaller the crop.

Since not enough strawberries are raised in New England to satisfy the demand, many plants have been shipped in from southern nurseries. In the past, this has often been unsatisfactory because growth often starts before or during shipment and all too frequently arrived in very poor condition. These shipping and storage problems plagued the nurserymen who produced the plants as well as the growers who purchased them. Often heavy losses were incurred because of deterioration of plants in storage. Fortunately, new methods for packing and storing strawberry plants are not only bringing solutions to these old problems but also opening up possibilities for solutions to other problems in strawberry growing.

The first change in strawberry plant storage methods was brought about by the introduction of polyethylene film. This film is somewhat permeable to gases but not to water. This meant that carbon dioxide could diffuse out of a package surrounded by this material and oxygen could pass in but water would be retained. Therefore, plants could be packed in "poly" bags or crates lined with "poly" film without the usual damp sphagnum or other moist material. This partly solved the plant storage problem by providing vastly improved moisture control.

The second change was initiated by the discovery that dormant strawberry plants can be stored at below freezing temperatures. If the plants are fully dormant when dug, they can be stored at 30°F for several months without injury. If the temperature rises above freezing, molds are likely to develop. If it drops below 28°F, the crowns may be injured by cold.

Thus, by digging when the plants are fully dormant and storing them at 30°F in polyethylene containers or polyethylene lined containers, strawberry plants can be held in storage for several months. These plants come out of storage in excellent condition and make a vigorous growth when planted.

One of the benefits of this new method of storing is that plants in good condition are available for setting any time of the year. In areas to the south of us where the seasons are longer, this method of storing plants has been used to very good advantage.

In Virginia stored plants set in mid-August have yielded as well as plants dug and set in the spring. By setting the bed in August the grower saves much labor in caring for the bed. This is particularly true in regard to weed control since the period of germination of most of the worst weeds is past.

In southern California, the use of cold storage strawberry plants set in August has made it possible to increase the early season portion of the crop when prices are high.

How then will this benefit New England? At present the chief benefit appears to be the possibility of obtaining plants in much better condition from southern nurseries. Experimental evidence indicates that late planting in this section is too uncertain.

In one year cold storage plants set in early June yielded as well as plants set in early May. The June set plants were thoroughly irrigated immediately after setting and a prolonged and unusual rainy period followed so that the newly set plants had unusually good conditions for growth. In another year cold storage plants set in mid-May, early June or late June yielded less than freshly dug plants set in late April. In this experiment the later the plants were set the less the yield.

Therefore, it appears that for those in New England who get their strawberry plants from southern nurseries, the plants can arrive in excellent condition for planting. Such plants should be set immediately on arrival. Holding them after arrival results in deterioration. So far holding plants in cold storage for late planting has produced uncertain results here and is not recommended.

---John S. Bailey

/ / / / / / / / / / / / / / / / / / / /

MECHANIZATION FOR STRAWBERRY GROWING

The national conference on the strawberry held at Rutgers University, New Brunswick, New Jersey January 24 and 25 was an extremely interesting and successful conference. A wide variety of subjects were presented by research workers from all over the United States and Canada. All the talks were concise and to the point.

One group of talks which seemed especially timely was on labor-saving machinery. Among these one discussion concerned a runner-cutting machine which has been developed by a grower in Connecticut. This is a rather large machine and is drawn behind a tractor and operated from the power take-off. This machine appears quite promising.

Several growers in the northwest have developed a picking machine which resembles very closely the pickle pickers used in the Connecticut Valley. These are simply long narrow moving platforms on which the pickers lay face down and pick the berries as the platforms are moved slowly across the field by a tractor. A second smaller type of picker has been developed in which the pickers sit upright in a frame over the row and pick between their legs as the machine is drawn slowly across the field.

One of the most interesting developments in mechanization was shown by Dr. Frank Gilbert of Wisconsin. A large grower in that state has almost completely mechanized his operation except for picking which is done by the public. This grower has gone so far as to have not only separate sprayers for weed control and insect and disease control, but has different types of sprayers which are best adapted to each operation.

This Wisconsin grower is one of the few who have fully appreciated the difference between spraying for weed control and spraying for insect and disease control and has adapted his equipment to each job. Too frequently growers forget that in weed spraying, rate of application and volume of material are extremely important. They make up their spray material and then do "a very thorough job of spraying". This usually results in an excessive application of the herbicide with consequent injury to the crop. It can't be emphasized too strongly that spraying for weed control and spraying for insect and disease control are two entirely different types of operations. Attempts to combine the two have usually proved to be quite unsatisfactory.

---John S. Bailey

/ / / / / / / / / / / / / / / / / / / /

LEAF ANALYSIS

High nitrogen level in McIntosh orchards has been a consistent problem for the last several seasons, even in a light crop year such as 1960. Trees which have received the same fertilizer program for several years will have a nitrogen level which is .2 to .3 of a per cent lower in a light crop year than it is in a heavy crop year.

Leaf Analyses of McIntosh Orchards

	No. of	Per Cent of Samples With:		
Year	Samples	High Nitrogen	Low Potassium	Low Magnesium
1959	136	46.3	15.4	38.2
1960	98	36.7	10.2	9.2
1961	108	50.0	5.6	8.3
1962	151	48.0	19.2	9.2

It can be noted in the table that low potassium level was more prevalent this year than the two previous seasons. However, since the samples are not from the same orchards each year, it is not feasible to interpret any trends. For example, one might say the reason for the increase in percentage of samples with low potassium in 1962 might be due to dry weather. On the other hand, rainfall was ample in 1959 and low potassium levels were quite prevalent.

Leaf samples were obtained from 40 orchards in 1962. In twenty-three of these orchards growers used a complete fertilizer but 16 growers used no nitrogen in some blocks. Some growers are not using nitrogen in an attempt to lower the nitrogen level in the trees and thereby increase fruit firmness and color. Growers attempting to lower the nitrogen level in their orchards should realize that it may take two or more years for this to occur following reduced rates of nitrogen application. On the other hand, a moderate nitrogen level should be maintained. Leaf analyses should be requested from county agents in order to follow the effect of the fertilizer program adjustments.

---William J. Lord

/ / / / / / / / / / / / / / / /

FRUIT NOTES

Prepared by Pomology Staff, Department of Horticulture
Cooperative Extension Service, College of Agriculture
University of Massachusetts, Amherst

APRIL 10, 1963

TABLE OF CONTENTS

Issued by the Cooperative Extension Service, A. A. Spielman, Dean and Director, in furtherance of the Acts of May 8 and June 30, 1914, University of Massachusetts, United States Department of Agriculture and County Extension Services cooperating.
Publication Approved by Alfred C. Holland, State Purchasing Agent, No. 44.

CHEMICAL WEED CONTROL IN THE ORCHARD

The elimination of grass and weeds under fruit trees may materially aid tree growth and mouse control. However, successful use of chemical weed killers requires close attention to details. With chemical weed control it is necessary to - read the label - follow the instructions - apply only on crops specified - not apply more than the suggested amount - make applications only during suggested seasons - and calibrate your sprayer to insure rate of application.

Sprayer Calibration

Calibration of the sprayer is as important as following the directions on the chemical label. Overdosage can cause injury to trees. Speed of sprayer, nozzle spacing, application rate and discharge rate per nozzle are the four major factors to consider in calibrating a farm sprayer. Farm equipment dealers can furnish information on sprayer calibration and proper nozzling.

If using a hand gun, the rate of discharge can be found by determining the time required to fill a container of known gallonage. This procedure will enable the grower to time the application for each tree.

If the amount of herbicide desired per acre is dissolved or suspended in 100 gallons of spray solution, then each gallon of spray solution should cover the number of trees listed in Table 1. Note that the heading for the first column is "distance sprayed from the middle of the trunk". This is an important consideration when spraying around large trees one foot or more in diameter. The number of square feet in the area three feet from the trunk of large trees is greater than that within 3 feet from the trunk of small trees.

All pesticide chemicals mentioned in this publication are registered and cleared for the suggested uses in accordance with federal laws and regulations. Chapter 727, Acts of 1960, Commonwealth of Massachusetts requires that all pesticides sold in Massachusetts be registered with the Massachusetts Department of Public Health. Trade names, where used for clearness, do not indicate endorsement nor imply that similar products are not satisfactory.

WARNING! MOST PESTICIDES ARE POISONOUS. READ AND FOLLOW ALL DIRECTIONS AND SAFETY PRECAUTIONS ON LABELS. HANDLE CAREFULLY AND STORE OUT OF REACH OF CHILDREN, PETS AND LIVESTOCK.

Table 1. Number of trees to cover with 100 gallons or with 1 gallon of spray solution when applying at the rate of 100 gallons per acre and spraying the stated number of feet from the tree trunk on all four sides of the tree.

Distance sprayed from middle of the trunk	No. Trees/100 Gals. Calculated as a square	No. Trees/100 Gals. Calculated as a circle	Approx. No. Trees/Gal. Calculated as a square	Approx. No. Trees/Gal. Calculated as a circle
3 feet	1210	1539	12	15
4 feet	681	868	7	9
5 feet	436	555	4	6
6 feet	303	385	3	4
7 feet	222	283	2	3
8 feet	170	217	1-3/4	2

Equipment

Many of the herbicides used for weed control are wettable powders that form suspensions rather than true solutions. If agitation is not sufficient, the materials will settle out and result in a higher concentration of herbicides in the bottom of the tank. This, in turn, could cause serious injury when the mixture is applied around the trees.

Mechanical agitation cannot be provided as easily as jet agitation. Jet agitators have been developed which can be connected to the pressure line between the pump and the by-pass valve. The agitation consists of a head with three orifices from which streams of spray solution are expelled. It is suspended by a hose to the bottom of the tank where the expelled streams agitate the spray suspension.

Herbicides should not be applied with a high-pressure spray rig unless it is modified. The equipment should have an operational pressure of 30 to 40 pounds per square inch. Low pressure and low gallonage rates help avoid forcing the spray into the soil - a common cause of herbicide injury.

There are two basic types of general farm sprayers - boomless and boom equiped. Either of these is available with a variety of pumps and carriers and can be tractor or trailer mounted. The boom sprayers in common use would have to be modified for orchard grass control because of the limited area to be covered.

Herbicides

The chemical weed control recommendations for 1963 are given in Table 2. The table is for the convenience of the reader but the information contained is necessarily brief. For further information read the notes which summarizes the weed control trials conducted in 1962. The lower dosage rates given in the table may result in satisfactory weed control and gives a greater margin of safety. For the most satisfactory results apply the foliage-active herbicides when the grass is 6-12 inches in height.

Table 2. Weed control recommendations for fruit trees - 1963

Crop	Herbicide and the Amount/Acre on Area Treated	Weeds Controlled	Remarks
Apples Bearing	DALAPON 85% WP (DOWPON) 5-10 lbs.	Perennial grasses	The 10 pound rate gave the best control of grass of all materials used in 1962. Does not control annual weeds. It is reported that Idared trees are sensitive to DALAPON (DOWPON).
	DALAPON 85% WP (DOWPON) 5-10 lbs. plus DIURON 80% WP (KARMEX) 2-4 lbs.	Perennial grasses and annual weeds	Do not use combination under dwarf or semi-dwarf trees.
	DALAPON 85% WP (DOWPON) 5-10 lbs. plus SIMAZINE 80% WP 2-4 lbs.	Perennial grasses and annual weeds	Safe to use on semi-dwarf trees in addition to those on seedling roots.
Non-bearing	DALAPON 85% WP (DOWPON) 5-10 lbs.	Perennial grasses	The 10 pound rate gave the best control of grass of all materials used on non-bearing trees in 1962. Does not control annual weeds. Trees should be at least 4 years of age.
	DALAPON 85% WP (DOWPON) 5-10 lbs. plus DIURON 80% WP (KARMEX) 2-4 lbs.	Perennial grasses and annual weeds	Do not use combination under dwarf or semi-dwarf trees. Trees should be at least 4 years of age.
	DALAPON 85% WP (DOWPON) 5-10 lbs. plus SIMAZINE 80% WP 2-4 lbs.	Perennial grasses and annual weeds	Trees should be at least 4 years of age.

	AMIZINE 7 lbs.	Perennial grasses and annual weeds	Use on trees established one year or more.
	AMITROLE 50% WP (WEEDAZOL or AMINO TRIAZOLE) 4 lbs.	Perennial grasses and annual weeds. Poison Ivy	Use on trees established one year or more. For best control of poison ivy, apply during June or July. A combination AMITROLE (WEEDAZOL or AMINO TRIAZOLE) with SIMAZINE or DIURON (KARMEX) will improve the weed control. Do not use the combination with DIURON (KARMEX) on dwarf or semi-dwarf trees.
	AMITROLE-T 2 lbs./gal. (CYTROL or AMITROL-T) 1 gal.	Perennial grasses and annual weeds. Poison Ivy	For best control of poison ivy apply during June or July. Use on trees established one year or more. A combination of (AMITROLE-T (CYTROL or AMITROL-T) with SIMAZINE or DIURON (KARMEX) will improve the weed control. Do not use the combination with DIURON (KARMEX) on dwarf or semi-dwarf trees.
<u>Pears</u> Bearing	DALAPON (DOWPON) or DALAPON (DOWPON) plus DIURON (KARMEX) may be used in bearing pear orchards. The recommendations for the use of these materials are the same as those given for bearing apple trees.		
Non-bearing	DALAPON (DOWPON), DALAPON (DOWPON) plus DIURON (KARMEX), AMITROLE (WEEDAZOL or AMINO TRIAZOLE) may be used in non-bearing pear orchards. The recommendations for the use of these materials are the same as those given for non-bearing apple orchards.		
<u>Peach</u> Bearing	DALAPON (DOWPON) is labelled for use under bearing peach trees. However, it should be used with care because peach trees are easily injured with this material. Apply at rate of 5 pounds 85% WP per acre on area treated.		

I. DALAPON (DOWPON)

Dalapon applied at the rate of 10 pounds per acre gave the best grass control of all the materials used in 1962. Although the control with 5 pounds of dalapon was not as satisfactory, this rate gives a greater margin of safety because of the tendency to overdose.

Good grass control was obtained in June and July when it was 18 to 24 inches high. Although the grass was killed, it remained standing and constituted an excellent mouse cover. It is recommended that tall grass be mowed and allowed to make 8-10 inches of regrowth prior to treatment.

When the sod cover is predominately grass, dalapon may be the only herbicide necessary the first year of use. When weeds are present in the orchard, either diuron or simazine can be added to the spray to control the seedling weeds that might otherwise move in where the grass was suppressed. Do not use the combination of dalapon and diuron on semi-dwarf or dwarf trees.

II. AMIZINE

Amizine is a mixture of simazine and amitrole. It has label clearance for use in bearing apple orchards but must not be applied under trees after full bloom. The label also states DO NOT ALLOW SPRAY TO CONTACT STEMS, FOLIAGE OR TRUNKS OF TREES SPRAYED. This is a serious limitation since it is difficult for the grower to spray without accidental wetting of the trees. Therefore, it is suggested that the use of amizine be limited to weed control under non-bearing apple trees.

Amizine at the rate of 7 pounds per acre gave good grass control but failed to suppress all broadleaf weeds - vetch and milkweed.

III. SIMAZINE

Simazine 85% WP at the rate of 4 pounds per acre failed to give satisfactory control of grass in several trials conducted in 1962. The treatments were applied during May and June under trees having well-established grasses. This time of application was used because many orchardists apply herbicides in May and June. Simazine should be applied as a pre-emergence treatment and is not effective when used at the 4 pound rate on established and growing vegetation. The best use of simazine in our orchards, which are grown under the sod-mulch system of culture, is in combination with a label-approved contact weed killer such as dalapon. The combination should eliminate many weeds which are likely to take over where the grass has been subdued. Simazine stunts but does not eliminate all sorrel, vetch, dandelions and other weeds.

Trials have been established using Simazine under apple trees on October 15, November 1 and as soon as the snow leaves the ground.

IV. GRANULAR SIMAZINE

Granular simazine has label clearance for use under non-bearing apple trees at the rate of 50 to 75 pounds per acre. This material should be applied prior to weed emergence.

Some growers have obtained good control of established grass and weeds with granular simazine applied in May. It is the writer's opinion that the granular simazine was applied under the non-bearing apple trees at a rate in excess to that recommended. In trials conducted in 1962, granular simazine applied at the rate of 75 pounds per treated acre failed to control grass.

Trials have been established using granular simazine under apple trees on October 15, November 1 and as soon as the snow leaves the ground.

V. DIURON (KARMEX)

Diuron at the rate of four pounds per acre gave varying degrees of orchard weed control in several trials conducted in 1962. The treatments were applied during May and June under trees having well-established grasses. This timing was used because many orchardists apply herbicides in May and June.

Diuron will not give satisfactory control of deep-rooted grasses or well-established annual weeds consistently. These weeds should be removed prior to treatment. Since most of our apple orchards are in sod, the best use of diuron is in combination with dalapon. Dalapon controls grasses but has no practical effect on other weeds. The combination will control grass and eliminate or dwarf many weeds which are likely to take over where the grass has been subdued. Diuron stunts but does not eliminate all sorrel, vetch, dandelions and other weeds.

Trials have been established using diuron under apple trees on October 15, November 1 and as soon as the snow leaves the ground.

---William J. Lord

/ / / / / / / / / / / / / / / / / /

Peach Tree Borer Control on Young Peach Trees

Successful control of peach tree borers by a preplanting treatment was reported in an article published in the June 1962 issue of the Journal of Economic Entomology, by E. H. Smith of the New York State Agricultural Experiment Station at Geneva. Since control measures are often omitted on young trees until they come into bearing, this simple method of treatment before planting should be of great value, especially, if new trees are planted among older ones which can serve as a source of infestation.

The treatment consists of dipping the roots and the basal portion of the trunk in a water suspension of 5 to 10 pounds of 50% endosulfan (Thiodan) wettable powder per 100 gallons. Wettable powder formulations require constant agitation. Although the results reported were based on dipping individual trees, presumably bundles of 10 to 25 trees could be dipped at one time. After treatment the trees were air dried before planting.

Both the 5 and 10 pound rate gave complete control of borers during the first growing season. There was no evidence of chemical injury to the roots or trunks by either rate under New York conditions. Since the lower rate gives complete control, there appears to be little reason for using the higher rate.

Control measures against the borers in subsequent years will require trunk sprays which should be applied to coincide with hatching of the earliest eggs. (Usually early to mid-July.)

---H. E. Wave
Department of Entomology and
Plant Pathology

/ / / / / / / / / / / / / / / / / /

POMOLOGICAL PARAGRAPH

Reducing Load of Fruit on the Leader of Trees on Malling Rootstock

Growers should avoid allowing too many fruit to develop on the leader of trees on Malling VII rootstock when they start to bear. This was evident in an orchard of 4-year Red Delicious and McIntosh on E. Malling VII this past month. Some of the leaders were arched toward the ground and in a few instances were broken off because of the weight of the previous crop.

---William J. Lord

/ / / / / / / / / / / / / / / / / /

THE CHEMICAL THINNING OF APPLES IN 1963

This spring we anticipate a somewhat heavier bloom and potential crop on many of our McIntosh trees than existed in 1962. The situation with other varieties is less clear-cut and will vary as usual from orchard to orchard.

Our experimental results of the past 3 years indicate that Sevin is an excellent thinner for McIntosh and Delicious when applied from one to three weeks after petal fall. In fact, it seems to be as good or better than NAD or NAA for McIntosh thinning and the best choice for Delicious at rates of 0.5 to 1.0 lb. (50% W.P.) per 100 gallons. Sevin has no visible harmful influence on the foliage at these concentrations and its chances of overthinning are minimal. It seems to be the safest thinning material we've ever used on these two varieties. In addition, it has about the same capacity to induce annual flowering as other thinning materials when the degree of thinning with these materials is comparable.

Sevin is not the complete answer for thinning all varieties, however. It's a very mild thinner and for this reason will not reduce the set of heavy setting Early McIntosh and Wealthy trees sufficiently by itself. For such varieties it may be necessary to use Sevin once or twice during the period from petal fall to 7 to 10 days later and then follow up with an NAD or NAA application after another 7 to 10 days elapse. Also, Sevin may not thin Golden Delicious appreciably or Baldwin as well as NAD or NAA.

Our 1963 revision of Special Circular 189, Chemical Thinning of Apples is now available through your County Extension Service or by writing to the Mailing Room, University of Massachusetts, Amherst, Massachusetts. This circular contains our suggestions for the use of NAD, NAA and Sevin as thinning agents on most of our commercial apple varieties.

---F. W. Southwick

/ / / / / / / / / / / / / / / / / /

WINTER LOSSES OF HONEY BEES

The winter of 1962-63 is considered to be the most severe in many year. Some concern has been expressed relative to the effects of the winter on honey bees.

Actual data at this time are fragmentary and somewhat variable. In Vermont, heavy winter loss is anticipated. Pennsylvania reports that colony losses in the central part of the state will be rather high. In New York, apparently colonies are wintering well in spite of the fact that they have not been able to have good cleansing flights.

Data from Massachusetts indicate that losses will be above average. One beekeeper in Worcester County reports a 5 per cent loss of his own bees but a 25 per cent loss in the apiary of a friend. From personal observations and conversations with beekeepers in various parts of the state, I would anticipate from 10 to 30 per cent winter loss, in other words above average losses are anticipated.

The problem is intensified by the lateness of spring. As of March 27 in Amherst, I have observed no bees bringing in pollen even though colonies have had good flight on several days. This would lead me to suspect that colony build up may be slower than normal and that colonies may dwindle in strength if they cannot replace the old bees that have overwintered.

It would seem advisable for fruit growers, who depend on rented bees for pollination, to contact in the near future the beekeepers who provide colonies in order to make certain that sufficient bees for pollination will be available.

Those who own their own colonies would do well to check colony condition to make sure the colonies are alive and well provided with honey and pollen. If

colonies appear to be light in weight, they can be fed. For complete directions on spring care of bees, Massachusetts Extension Service Leaflet 148 - BEEKEEPING - is available.

---F. R. Shaw
Dept. Ent. & Pl. Path.

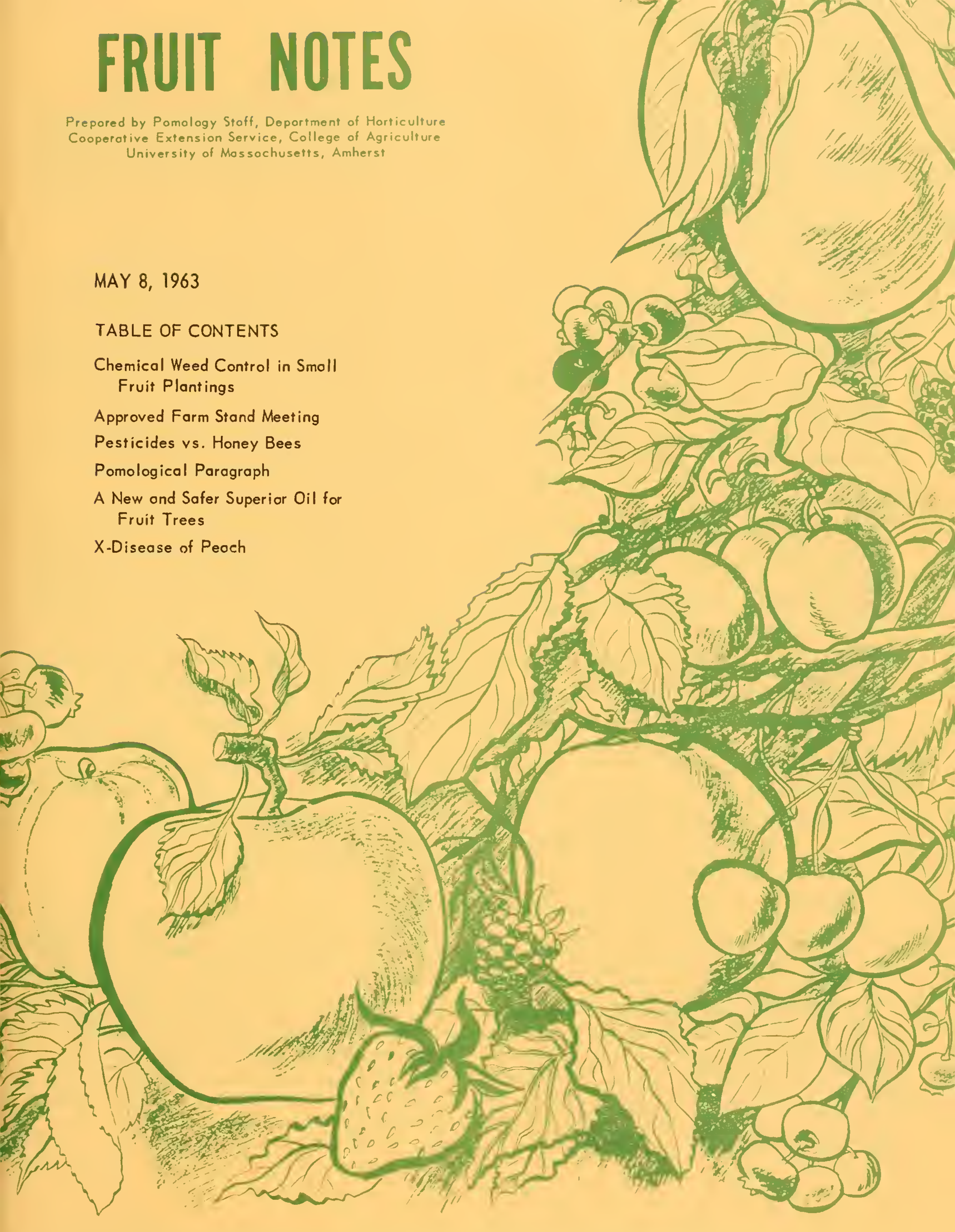
/ /

FRUIT NOTES

Prepared by Pomology Staff, Department of Horticulture
Cooperative Extension Service, College of Agriculture
University of Massachusetts, Amherst

MAY 8, 1963

TABLE OF CONTENTS



Issued by the Cooperative Extension Service, A. A. Spielman, Dean and Director, in furtherance of the Acts of May 8 and June 30, 1914.
University of Massachusetts, United States Department of Agriculture and County Extension Services cooperating.
Publication Approved by Alfred C. Holland, State Purchasing Agent, No. 44.

CHEMICAL WEED CONTROL IN SMALL FRUIT PLANTINGS

Chemical weed control is the newest of weed control methods and is undergoing rapid changes as new materials are introduced. Therefore, this discussion will be limited to chemical methods. For a fuller discussion of weed control in small fruit plantings, see Fruit Notes for June 1962.

Before using chemicals, several important points should be considered. First, chemicals cannot entirely replace cultivation, at least not with such crops as strawberries and raspberries. Especially for the strawberry, the soil needs to be kept in a friable condition for the prompt and rapid rooting of runner plants. Second, chemicals, like a sharp knife, can be a great help if properly used; improperly used they may result in severe injury. Third, spraying with weed killers is entirely different from spraying with fungicides or insecticides. With the latter, one makes up a mixture of the proper strength and sprays until the plant and foliage are thoroughly covered without particular regard to the amount of the spray mixture applied. On the other hand, recommendations for the application of herbicides are usually based on so many pounds or so many gallons of the commercial material, or so many pounds of actual active ingredient, per acre. Therefore, it is very unwise to get careless about amounts where chemicals are being applied for weed control. The equipment used should be calibrated so that the required amount can be applied fairly accurately. The County Agricultural Agent or equipment manufacturers can usually furnish the information needed for this calibration. Fourth, use of chemicals on food products is strictly regulated by law. These laws are for the protection of both the producer and consumer. To be released for sale and use, a chemical must be approved by the United States Department of Agriculture as not injurious to the crop and by the Federal Food & Drug Administration as not hazardous to human health. The use of a chemical has to be approved for each kind of plant to which it is applied. In many cases this use is limited to a certain region of the country. Also, rates of application and timing are specified. Therefore, it is extremely important that the user of any chemical for weed control on or around fruit plants read the container label very carefully and follow its directions precisely.

WARNING: MOST PESTICIDES ARE POISONOUS. READ AND FOLLOW ALL DIRECTIONS AND SAFETY PRECAUTIONS ON LABELS. HANDLE CAREFULLY AND STORE OUT OF REACH OF CHILDREN, PETS AND LIVESTOCK.

FOLLOW ALL SAFETY PRECAUTIONS.

Avoid contaminating streams, lakes and ponds with insecticides.

NOTE

All pesticide chemicals mentioned in this publication are registered and cleared for the suggested uses in accordance with federal laws and regulations. Chapter 727, Acts of 1960, Commonwealth of Massachusetts requires that all pesticides sold in Massachusetts be registered with the Massachusetts Department of Public Health. Trade names, where used for clarity, do not indicate endorsement nor imply that similar products are not satisfactory.

Strawberries

Sesone (SES) has been recommended for the control of summer weeds in strawberries for a number of years. If used according to directions, it is a fairly good weed killer and is very unlikely to damage the strawberry plants. This chemical is in an inactive form when applied to the soil. It must be changed to the active form by bacteria before it becomes effective. Furthermore, it is effective against germinating seeds and very small weeds only. After the weed seedlings become 1/4 of an inch tall or more, Sesone is not effective.

To obtain the best results with Sesone, the field should be thoroughly cultivated and hoed to eliminate all weeds immediately before application. Because of the necessity for bacterial action to make Sesone active, the soil should be at a moisture content suitable for a good seed bed. If the soil is very dry and there is no rain for several days, it may be necessary to irrigate in order to make Sesone effective.

The usual rates of application for Sesone are 2 pounds per acre on very light soils, 2-1/2 pounds per acre on light soils, 3 pounds per acre on medium soils, and 4 pounds per acre on heavy soils. For small areas, one level teaspoonful for 150 square feet equals one pound per acre.

Since newly set strawberry plants are sensitive to Sesone, it is safest to wait two to three weeks after planting before making the first application. Applications made while runner plants are rooting may cause temporary injury and delay in the rooting process. When Sesone is used during the bearing year, avoid undesirable residue by <u>not</u> making applications later than one week before picking begins.

2,4-D was one of the first of the modern weed killers used on strawberries and looked very promising for a time. However, it was soon found that it could seriously upset runner growth if applied during the period of runner development. Furthermore, if it is applied during fruit bud formation or at any time when there are flowers or fruit on the plants, the result is small misshapen berries. Therefore, the periods when 2,4-D can be used are quite restricted. Probably its greatest usefulness is in assisting to clean up the bed after the first crop where the bed is to be renovated and a second crop produced. The recommended rate is 1 to 1-1/2 pounds of actual 2,4-D acid equivalent per acre.

Chloro-IPC (CIPC) is useful for the control of fall and winter weeds, particularly chickweed. This is a material which can be extremely helpful if used properly but can do serious harm if not used according to directions. First, it should never be used until the strawberry plants have become dormant. This is usually the middle of November or later. Second, it should never be used in excess of recommended rates. Although it has been cleared for use at rates up to 3 pounds per acre, it is felt that under Massachusetts conditions 1 pound per acre is much safer.

There are several of the dinitros which have been cleared and can be used for the control of fall and winter weeds in strawberries but in Massachusetts these are generally less effective than Chloro-IPC. These materials are not selective and act by killing the tops of plants. Because of this "burning" action, they are much more effective on warm sunny days than on cold days. Like CIPC, they must be applied after the strawberries become dormant. Since warm, sunny days are not plentiful after mid-November, the usefulness of these materials is limited. Since there are several formulations of these materials, it is wise to follow very closely the manufacturer's directions as to rate of application.

Dacthal is the most recent material to be cleared for weed control in strawberries. Like Sesone, it appears to be more effective when applied to a weed free soil. In Ohio satisfactory results followed four applications made in a single season at rates of 4 to 6 pounds active ingredient per acre. Summer applications have some carry-over effect into the fall for controlling chickweed and other fall weeds. Late October or early November applications were found to be very effective in controlling fall and winter weeds. During 1962 Dacthal looked promising both in grower and experimental trials.

Blueberries

Diuron has been cleared for use as a weed killer in blueberries at the rate of 2 pounds per acre. It is most effective when applied to a weed-free soil in early spring. In no case should it be applied within 60 days of harvest. Diuron is quite effective against most annual broadleaf weeds and grasses but is much less effective against the deep-rooted perennials.

Chloro-IPC has also been cleared for use around cultivated blueberries up to a total of 12 pounds per acre applied during the dormant season. Since this is essentially a grass and chickweed killer and can be used only during the dormant season, its usefulness is limited.

2,4-D up to 3 pounds per acre has also been cleared for use on cultivated blueberries but care should be exercised not to get it on the leaves of the plants. Since its use is limited to fall application and it is effective only against broadleaf weeds, its use in blueberries is also limited.

Raspberries

Only two materials have been cleared for weed control in raspberries in the Northeast. 2,4-D can be used to control broadleaf weeds since mature canes are quite resistant to it. However, care should be exercised to use a directed spray and not to use it at a time when the growing tips of the new canes will be sprayed. It may be applied at the rate of 1 pound actual acid equivalent per acre.

Chloro-IPC, as with strawberries and blueberries, can be used as a dormant application up to a total of 8 pounds per acre.

Grapes

Simazine 80-W has been cleared for use on grapevines at least 3 years old. It should be applied before the weeds emerge in the spring at rates from 2 to 6 pounds per acre.

Dalapon may be used for grass control up to 14.8 pounds per acre. The spray should be so directed that it does not hit the vines.

Diuron, as previously stated, is most effective when applied in the spring before weeds germinate. It can also be applied in the fall for the control of fall and winter weeds. The total amount applied should not exceed 4.8 pounds per acre. If the application is split, half may be applied in the spring and half in the fall.

The herbicidal formulas of dinitro may also be used on grapes up to a total of 1.9 pounds per acre active ingredients. These are most useful where most of the weeds are annuals.

Amino triazole may be used as a dormant application at rates not to exceed 2 pounds per acre on vines 3 years old or older.

Whenever using herbicides, read the label carefully until you thoroughly understand its directions. Then follow them exactly.

---John S. Bailey

/ / / / / / / / / / / / / / / / / / / /

APPROVED FARM STAND MEETING

The annual spring meeting of the program members was held in April at which time there was a free exchange of ideas and discussion of the rules and regulations of the program. The inspections and price reports are two outstanding assets of the Approved Farm Stand Program in the opinion of the program members.

The members requested that the report of apple prices at the Approved Farm Stands be continued. In the past, three reports have been issued - pre-season, one month later, and one month later. These reports give the operators first-hand information on apple prices at other Approved Farm Stands.

The Approved Farm Stands are inspected twice during the fall months by an inspector hired by the program members. Plaques are awarded annually to the outstanding Approved Farm Stands. The 25 per cent of the membership with the highest quality of packs receive the awards.

---William J. Lord

/ / / / / / / / / / / / / / / / / / / /

PESTICIDES VS. HONEY BEES

It is recognized that pesticides are necessary for the production of a crop of saleable fruit. To obtain a fruit set, bees are necessary to transfer pollen from the anthers to the stigmas. Consequently it is to the advantage of both the fruit grower and the beekeeper to minimize the chances for bee losses through exposure to pesticides toxic to bees.

Honey bees may be poisoned by contact with sprays or dusts at the time of application, by exposure to residues of pesticides and possibly in a few instances, from a fumigating action. For example, parathion has been reported to have fumigating effects on bees even under field conditions. Since bees collect nectar, pollen and water and carry them to the hive, these materials, if contaminated, are capable of causing loss of brood (immature bees), "nurse bees" and the queen. The extent of damage from poisoned pollen, water and nectar may range from slight (often imperceptible) to loss of the entire colony depending primarily on the toxicity of the pesticide and its persistance in pollen.

To obtain information on the effects of pesticides on honey bees in Massachusetts, we established a research project to investigate, among other problems, the effects of these materials on honey bees. We have exposed bees to direct applications and also to deposits and residues of a number of pesticides. Among these were DDT, carbaryl (alone and in combination with certain fungicides), Dylox, Eastern States Garden & Orchard Spray, endosulfan, Guthion, malathion, dieldrin, naled, Imidan, Zectran, dodine, endrin and the microbial formulation Thuricide.

In these experiments, where bees were sprayed directly, the organic phosphates (including Guthion, naled, Dylox and Imidan) were more toxic than the other materials tested. Carbaryl and endosulfan, while somewhat less hazardous, were not sufficiently so to warrant their substitution for the phosphates. DDT and Thuricide exhibited the least toxicity with the latter causing no discernible mortality. It is of interest to note that some honey bees are becoming resistant to DDT.

Exposure to dried pesticide residues on foliage yielded variable results depending on materials and dosage. In most instances, bees exposed to deposits on the day of application had an appreciable reduction in length of life. However, deposits of DDT or Thuricide did not cause appreciable reductions in length of life.

Exposures of honey bees to residues four to five days after application also produced results which varied with the treatment. For example, carbaryl in combination with thiram was more toxic than in similar combination with ferbam or glyodin. Both dieldrin and Guthion residues were highly toxic after four days producing 50 per cent mortality within 36 and 24 hours respectively. The remainder of the pesticide residues did not cause appreciable mortalities after four or five days.

Our suggestions for reducing bee losses from pesticides include:

1. Spraying early in the morning or in the evening, since fewer bees will be exposed to direct contact action of pesticides at these times.

2. Do not spray plants attractive to bees during their bloom period with materials known to be toxic to these insects.

3. Avoid contamination of the area where spraying equipment is being filled. Bees often collect water from such accumulation and may thus be poisoned.

4. There is evidence that if spraying with toxic materials is necessary during the bloom period, colonies can be partially protected by covering them with moist burlap during the application period. This may reduce the hazard of contact action but not the effects of residues.

---F. R. Shaw
Department of Entomology
and Plant Pathology

/ / / / / / / / / / / / / / / / / /

POMOLOGICAL PARAGRAPH

Red Delicious More Popular than McIntosh in Vending Machines

During a recent visit to some packing sheds in New York State, the writer visited with a grower who had vending machines for apples. The grower stated that 65% of the apples sold from these machines were Red Delicious and 35% McIntosh.

---William J. Lord

/ / / / / / / / / / / / / / / / / /

A NEW AND SAFER SUPERIOR OIL FOR FRUIT TREES

A new 60 second superior oil is being evaluated and tested as a possible replacement of existing oil types. The new oil has been designed to provide complete safety to foliage when applied after considerable new growth has occurred, possibly even including cover sprays. Previously, oil sprays could be applied only during the dormant or delayed dormant bud stage due to their tendency to injure foliage, or due to their incompatability with other spray materials.

To design an oil with this potential, specifications called for a highly refined petroleum oil low in unsulfonated residues and with a short residual. The unsulfonated residues are highly toxic to plant tissues. Injury can also be eliminated or greatly reduced if the oil does not persist on the foliage after completing its pesticidal action.

Since the mode-of-action of the highly refined petroleum oils are largely or wholly mechanical - causing death by asphyxiation, they preclude the development of resistance characteristic of organophosphorus and other pesticides. If use of the 60 second oil can be extended to include the cover sprays for the control of such pests as the European red mite, a new era in mite control may result. Furthermore, since petroleum oils, as used, are exempt from a tolerance, they present no residue problem on fruit.

Besides the European red mite, oil sprays have been used effectively to control scales, aphids, mealy bugs, and psyllids. They are also effective ovicides for codling moth, oriental fruit moth, leaf rollers, and cankerworms.

---H. E. Wave
Department of Entomology
and Plant Pathology

/ / / / / / / / / / / / / / / /

X-DISEASE OF PEACH

Twenty years ago X-Disease of peach was common in many orchards and caused extensive and serious losses. Systematic removal of diseased trees by growers and eradication of chokecherries, which carry the disease, near orchards has brought the disease under control. An occasional tree with X-Disease is still found but, frequently, reports of X-Disease turn out to be other troubles which, at least in part, cause similar symptoms.

Names, Cause and Plants Attacked:

The disease was first reported from Connecticut in 1933 and was called X-Disease because the cause was not known. The name still persists but other names for the disease are eastern X-Disease, yellow-red disease, yellow-red virosis and eastern yellow-red virosis.

Stoddard, in 1938, worked with the disease in Connecticut and reported the cause to be a virus and that, "as far as is known, X-Disease occurs in nature only on peach, nectarine and chokecherry". It has also been found on sweet and sour cultivated cherries and has been transmitted artificially, by budding and grafting, to many plants related to peach, cherry and plum and even to unrelated plants such as tomato, carrot, parsley and periwinkle. Wild black or rum cherry (*Prunus serotina*) and beach plum (*P. maritina*) could not be infected and are considered immune.

Symptoms on Peach:

Diseased trees appear normal and cannot be distinguished from healthy trees for the first 6 or 8 weeks after growth starts. The leaves are normal and so are the flowers. About mid-June, leaves on branches scattered throughout the tree, or on only one or two branches, start to turn yellow, develop yellow-red blotches, become brittle, and, on many, spots fall out leaving a ragged tattered leaf. Some leaves may roll longitudinally with the edges rolled upward, and others may be distorted or twisted. Often normal leaves are interspersed with the diseased leaves.

Up to this point, the symptoms are similar to those caused by any one of several conditions. But with X-Disease the leaves drop, beginning at the base of the twig and progressing toward the tip, until finally there remains only a tuft of undersized green or yellowish leaves at the tip.

The immature fruit on severely diseased branches drop soon after leaf symptoms appear. Fruit on less severely diseased branches may grow to maturity but are undersized, ripen prematurely, have poorly developed pits, and an insipid slightly bitter taste. Branches with normal leaves and no disease symptoms produce normal fruit.

Diseased bearing trees leaf out normally in spring and may live for many years but become commercially worthless in 2 to 4 years after becoming diseased. Seedling trees 3 years old or less may be killed before they reach bearing age.

Symptoms on Chokecherry:

The change in leaf color begins about the same time as on peach - i.e. 6 to 7 weeks after growth starts in spring or about mid-June. Newly infected chokecherries start off with dull green or yellowish leaves which become brilliant yellow, orange or red by August. Often the midrib remains green. The second and third year after infection the leaves are less brilliantly colored and even dull. Tufts or rosettes of small stunted leaves develop on the ends of the branches some of which die and eventually the whole plant dies.

Transmission:

The disease has been transmitted from peach to peach, peach to chokecherry, chokecherry to peach and chokecherry to chokecherry. Transmission has been successful with buds, bark patches, and grafts but not with plant juice.

The disease first appears in an orchard near the edges, near diseased chokecherries. It may spread to other trees in an orchard at the rate of 20% of the trees in one year. How does it pass from chokecherry to peach and from peach to peach in an orchard so rapidly? No one really knows. Certainly there is no budding or grafting of diseased chokecherries onto commercial peaches and no grafting from peach to peach in an established orchard. It is believed that insects may be the carriers and there is some evidence to support this view. In experiments, the virus has been successfully transmitted to healthy plants by at least one leaf hopper.

Control:

X-Disease has been successfully brought under control by the following practices.

(1) Removal of diseased peach trees as soon as they are found - they will be unproductive and die eventually anyway. Cutting out diseased branches in an attempt to save the tree does not work.

(2) Killing chokecherries for some distance around the orchard. This can be done easily with the modern effective chemical weedkillers. Also killing other cherries such as pin or bird cherry which may be carriers.

(3) When starting a new orchard, killing out the chokecherries and other wild cherries in the area and then planting disease-free plants obtained from a reliable nursery.

---C. J. Gilgut
Department of Entomology
and Plant Pathology

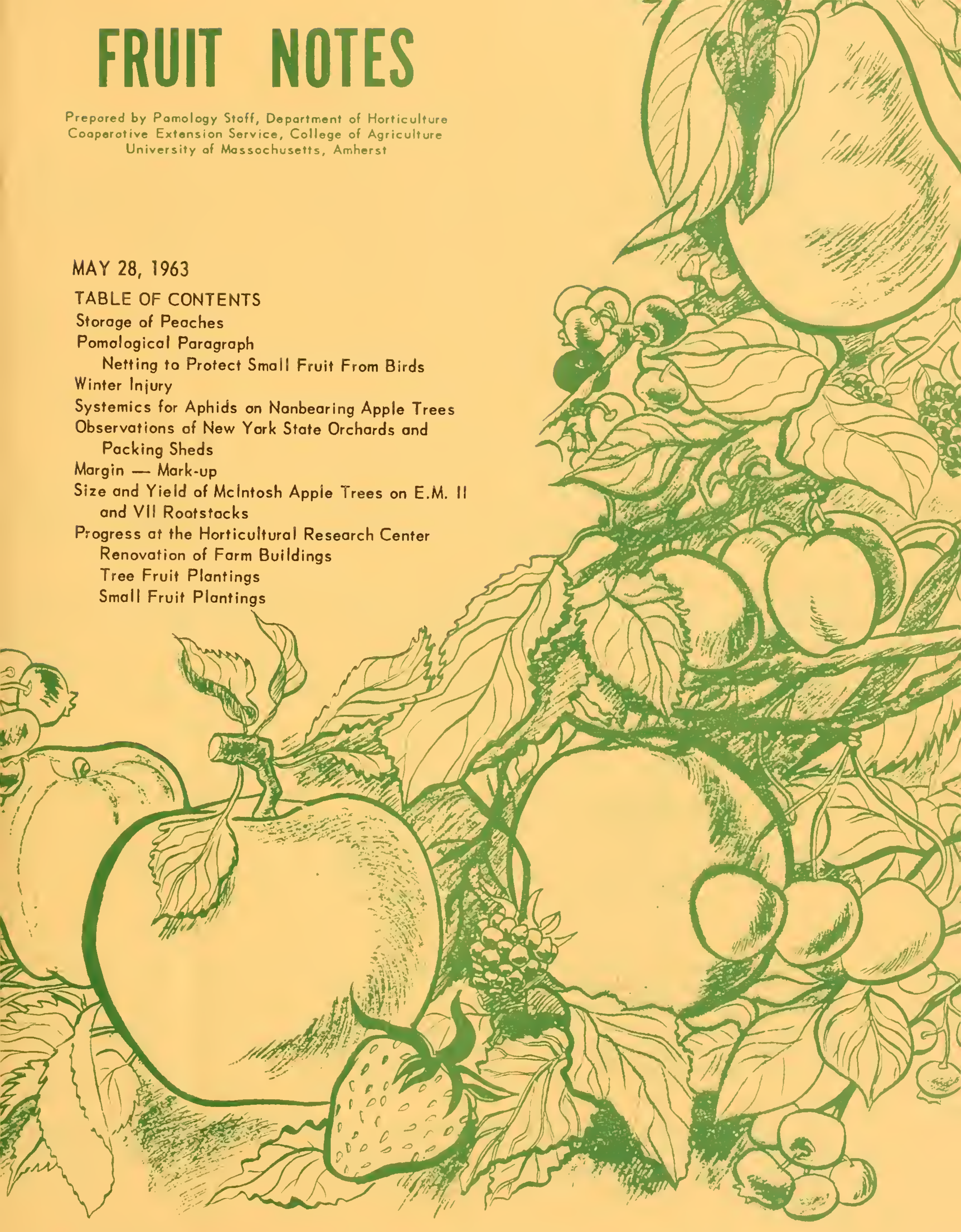
/ / / / / / / / / / / / / / / /

FRUIT NOTES

Prepared by Pomology Staff, Department of Horticulture
Cooperative Extension Service, College of Agriculture
University of Massachusetts, Amherst

MAY 28, 1963

TABLE OF CONTENTS



Issued by the Cooperative Extension Service, A. A. Spielman, Dean and Director, in furtherance of the Acts of May 8 and June 30, 1914; University of Massachusetts, United States Department of Agriculture and County Extension Services cooperating.
Publication Approved by Alfred C. Holland, State Purchasing Agent, No. 44.

COUNTY EXTENSION AGENTS IN SUPPORT OF THE FRUIT PROGRAM

BARNSTABLE	Oscar S. Johnson, County Extension Agent in Agriculture, Cape Cod Extension Service, Barnstable (Tel. FOrest 2-3255)
BERKSHIRE	Dick L. Boyce, County Extension Agent in Agriculture, Berkshire County Extension Service, Federal Building, Pittsfield (Tel. Pittsfield HIllcrest 8-8285)
BRISTOL	Harold O. Woodward, County Extension Agent in Agriculture, Bristol County Agricultural School, Center Street, Segreganset (Tel. Dighton NOrmandy 9-3611 or 9-2361)
DUKES	Ezra I. Shaw, County Extension Agent in Agriculture, Dukes County Extension Service, Vineyard Haven (Tel. Vineyard Haven 694)
ESSEX AND MIDDLESEX	Max G. Fultz, County Extension Agent in Agriculture, Middlesex County Extension Service, 19 Everett Street, Concord (Tel. Concord EMerson 9-4845)
FRANKLIN, HAMPDEN AND HAMPSHIRE	G. Everett Wilder, Pioneer Valley Extension Agent in Agriculture, Hampden County Improvement League, 1499 Memorial Avenue, West Springfield (Tel. Springfield REpublic 6-7204)
NORFOLK	Howard Wilson, County Extension Agent in Agriculture, Norfolk County Agricultural School, 460 Main Street, Walpole (Tel. Walpole MOntrose 8-0268 or 8-0269)
PLYMOUTH	Dominic A. Marini, County Extension Agent in Agriculture, Plymouth County Extension Service, Court House, Brockton (Tel. Brockton JUniper 6-4993)
WORCESTER	William R. Goss, County Extension Agent in Agriculture, Worcester County Extension Service, 36 Harvard Street, Worcester (Tel. Worcester PLeasant 3-5477)

All pesticide chemicals mentioned in this publication are registered and cleared for the suggested uses in accordance with federal laws and regulations. Chapter 727, Acts of 1960, Commonwealth of Massachusetts requires that all pesticides sold in Massachusetts be registered with the Massachusetts Department of Public Health. Trade names, where used for clearness, do not indicate endorsement nor imply that similar products are not satisfactory.

WARNING! MOST PESTICIDES ARE POISONOUS. READ AND FOLLOW ALL DIRECTIONS AND SAFETY PRECAUTIONS ON LABELS. HANDLE CAREFULLY AND STORE OUT OF REACH OF CHILDREN, PETS AND LIVESTOCK.

STORAGE OF PEACHES

Several years ago it was rather common to find peaches stored at 40°F or higher. As a reminder to growers, research workers have found that a storage temperature of 32°F is most suitable for peaches. There is practically no softening of fruit at this temperature. Haller and Harding (U.S.D.A. Technical Bul. 680) showed that peaches soften 20 times as fast at 80°F as at 32° (Table 1).

Table 1. Daily Rate of Softening of Peaches at Various Temperatures.*

80°F	70°F	60°F	50°F	40°F	32°F
lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
4.0	3.4	2.0	1.1	.34	.19

*Mean of 4 varieties for two years.

In addition to the slower ripening rate of peaches at 32°F, less mealiness and breakdown occurs at this temperature than at higher storage temperatures. Haller and Harding found that abnormal ripening takes place if peaches are stored between 36° and 50°F for any extended period of time. Undesirable flavor developed at 50°F and rapid flavor loss and internal breakdown and mealiness occurred at 40° and 36°F.

Growers who have had poor results when storing peaches for two or three weeks might try delayed storage. If the peaches are to be sold at the roadside stand, hold them at 70 to 80°F after harvest, until they are practically eating ripe before placing them in storage. This procedure as research results have shown may prevent the development of mealiness. Fruit to be sold to stores should not be held as long at 70 to 80°F because firmer fruit is necessary for this method of sale.

A delay in storage is not necessary if peaches are to be held in storage for only three or four days.

Only peaches free of bruises and brown rot infection should be stored. Even under the most favorable conditions peaches cannot usually be stored longer than two or three weeks.

---William J. Lord

/ / / / / / / / / / / / / / / / / / / /

POMOLOGICAL PARAGRAPH

Netting to Protect Small Fruit From Birds

At present there appears to be no satisfactory method of protecting fruit from the depredations of birds except covering with some sort of netting. A list of suppliers of netting can be obtained by dropping a card to the Editor of Fruit Notes, Department of Horticulture, French Hall, University of Massachusetts.

WINTER INJURY

Bearing apple trees in several orchards suffered considerable injury to the trunks during the winter of 1962-1963. The bark on the injured trees was in some instances split, but most frequently pulled away from the wood. Therefore, it was necessary to thump the bark in order to determine injury. A hammer is a satisfactory tool for this purpose.

Although the winter injury was predominantly on the north side of the tree, in two orchards the south side of the tree trunk was affected.

The results of grower and personal observations revealed that the winter injury was mainly confined to bearing McIntosh trees. One grower estimated 65% or more of his bearing McIntosh trees 12 years or older were injured. Cortland, Macoun, Red Delicious, Golden Delicious and Early McIntosh had little or no injury.

The winter of 1955-1956 was the previous time that severe winter injury occurred. The injury was most severe and extended to the lower scaffold limbs. Also, it was most evident on the south side of the trees. Variety susceptibility was similar to that of this past winter.

In 1955-1956 the injury appeared to be correlated with pruning in late December and early January. This was not the case this past winter. Although, one grower who keeps excellent records, reported that on trees pruned January 4, 1963 the injury was much more severe than on those pruned January 24 to February 5. The inconsistensy of plant response to environmental factors always makes interpretation difficult.

The main purpose of this article is to have a written account of the damage and the method of treatment. Experience gained with the repair of damage that occurred in 1955-1956, which was recorded in the May 1956 issue of Fruit Notes, was of value this past spring.

Prior to 1955-1956 growers used a hammer and tacks to tighten the bark to the wood on winter injured trees. In 1956, gun-type staplers with 9/16 inch staples were used. The staples were driven one or two inches apart in order to insure good bark-wood contact. The injured area was then painted with cold water soluble asphalt emulsion commonly used as a grafting compound. McIntosh trees having very little "tight bark" prior to treatment made remarkable recovery.

In 1963, gun staplers and air guns are being used. These air guns are being operated from a compresser used for pneumatic pruners. One grower is using one inch crown staples of 21/32 inch length in the air gun. The same grower welded a handle on a mowing machine cutter bar section (serrated) which he used for scraping off the old shedding bark prior to stapling.

---William J. Lord

/ /

SYSTEMICS FOR APHIDS ON NONBEARING APPLE TREES

The green apple aphid causes serious injury to young nonbearing trees if not controlled. The injury is twofold: new growth is stunted and deformed by toxic secretions in the saliva of feeding aphids, and the honey dew secreted by the aphids drips on the foliage and provides an ideal medium for sooty molds to grow. This reduces the photosynthetic area of the leaves and results in poor tree growth.

Since most growers do not take the time to adequately spray or dust for insects on young nonbearing trees, a systemic insecticide might prove helpful, especially in aphid control. Its use would make repeated applications unnecessary. Application of a suitable systemic should be made before the aphid infestation has had time to build up. Several of the systemic phosphate materials have been used successfully in experimental trials against aphids. With few exceptions, systemic insecticides are not yet cleared for use on bearing trees.

Two methods of application are available for use on nonbearing trees: (1) foliar application, and (2) soil application (granular). Demeton at 3/4 pint/100 gallons as a full coverage foliar spray is currently recommended for aphid control on bearing trees and can be used at this dosage on nonbearing trees. Di-syston 10% granular, applied at 4 ounces for each inch of trunk diameter, has given good control of aphids. Spread granular uniformly from trunk to dripline on all sides, work into soil, and water thoroughly. Higher dosage may be necessary on heavy organic soils. Follow label directions and do not overapply.

---H. E. Wave
Department of Entomology
and Plant Pathology

/ / / / / / / / / / / / / / / / / /

OBSERVATIONS OF NEW YORK STATE ORCHARDS AND PACKING SHEDS

Visits to fruit growing areas in other states are always of interest and profitable. Growers should make an effort to visit orchards and packing sheds in their own area and in other fruit growing regions, because ideas obtained during these visits will result in better orchard and packing house management procedures and in savings. In March, three Massachusetts apple growers and the writer had the opportunity to visit orchards and packing sheds in the Hudson Valley and Champlain areas. Below are a few comments on what we observed.

Orchard Management

There appears to be a tendency to leave more scaffold limbs in bearing apple trees in New York than Massachusetts. Interplanting young trees in bearing orchards was frequently observed. Having two ages of trees in the block presents a spray, fertilizer and pruning problem. Naturally, the New York growers are well aware of this fact and many would prefer to rotate blocks of trees rather than rotate trees within a block.

As with many Massachusetts growers, the New York apple growers are concerned with the nitrogen levels in their McIntosh orchards. It was of interest to note that for the Peru area (Champlain) Dr. Arthur Burrell considered the nitrogen level of 1.80 to 1.90 per cent for bearing McIntosh was optimum even though the climate is more favorable for color development than in many other McIntosh producing areas. In Massachusetts, we have set an optimum of 1.80 to 2.00 per cent nitrogen for bearing McIntosh.

Eighty-five to 90 per cent of the acreage in the Peru fruit growing area is planted to McIntosh which presents a problem at harvest. Large crews are necessary to harvest the fruit in prime condition.

There is little interest in semi-dwarf trees and Red Delicious in the Peru area because of the fear of winter injury.

Bulk Boxes - New York apple growers are gradually switching from field crates to bulk boxes, because of the savings in container cost, labor, transportation and storage space. However, many of the growers are cautious in the adaption of this type of container because of cost of water dumpers and driers, space requirements of this equipment and their dislike to use grading machines for McIntosh apples.

The question of bulk boxes is foremost in the minds of many apple growers throughout the New England-New York area. Growers are interested in the possible savings with their use but at present if water dumpers are to be used, they are feasible only in the larger packing sheds. Over-mechanization of our smaller packing sheds must be avoided. It is very easy to over-invest in equipment without obtaining sufficient increase in efficiency to warrant the investment.

Packing Sheds - The degree of mechanization of the New York packing houses varies considerably from area to area within the state. In the Peru area apples are hand packed directly from field crates and very little packing equipment is used. Packing houses in the Hudson Valley area are using apple sorting and sizing equipment for regular storage apples but some go to hand packing of CA McIntosh.

In the hand packing operations, individual packers averaged 70 to 80 bushels of packed fruit per day. On the other hand, it appeared that the per worker output of packed fruit in some highly mechanized packing sheds was not much higher.

A recent report on packing apples in the Northeast (Marketing Research Report No. 53) stated that all-manual packing operations were the most efficient in comparison to mechanized packing operations as long as skilled packers can be obtained, the wage rate remained low, and the daily volume did not exceed the space available for packing stations. "Should the cost of labor rise, the manual operations would rapidly become more costly and the mechanized packing lines would become relatively more efficient. Or, if skilled labor should become difficult to hire, the manual packing line would become less efficient, because it requires greater skills of its workers than do the other more mechanical lines."

Several efficient hand grading operations were observed in New York and some of the procedures and packing area arrangements if adapted by some Massachusetts growers would increase the efficiency of the hand packing operation. The arrangement of the work stations for the individual packers in some of the New York

State packing sheds was similar to that described by Perkins and Burt (An Improved Work Station for the Manual Sorting, Sizing and Packing of Apples - Maine Agr. Exp. Sta. and U.S.D.A. Misc. Publication 641). All work stations are tilted toward the packer which gives a clear view into each container and makes it easier to slide full containers from the packing platform. Some growers placed metal strips on top the packing platforms or cover them with sheet metal to further facilitate the ease of sliding full containers. The supply racks are located directly over where the cartons were being packed. The racks are divided into sections with pads and partitions in each section for the carton being packed directly below it. A chute was provided for the disposal of cull apples. These are constructed of wood or sheet metal. The packer merely drops the cull apples into the chute and they roll into a box. This eliminates the necessity of the packer having to reach under the table to dispose of cull apples.

In one storage a switch was located by each packer. When a packer had a full carton she flicks the switch which turns on a red light. The lights are located so they can be easily seen by the man who is responsible for keeping the conveyer loaded with fruit for packing and the removal of filled cartons. This helps reduce the shouting and confusion in the packing shed.

---William J. Lord

/ / / / / / / / / / / / / / / / / /

MARGIN --- MARK-UP

The terms "margin" and "mark-up" are being used in discussions of prices of apples to retail stores. There does not appear to be a uniform understanding of the two terms.

A 25% margin is approximately equal to a 33% mark-up.
A 33% margin is approximately equal to a 50% mark-up.
A 40% margin is approximately equal to a 66% mark-up.
A 50% margin is approximately equal to a 100% mark-up.

The word "approximate" is used here because of the current practice of rounding the percentages of odd numbers to whole cents.

"Margin" is used generally in the analysis of retail businesses because the total sales for a period is the one solid figure available. All costs of goods sold, labor, overhead and profit must come out of the total sales amount. In this instance, "margin" is used to represent the percentage of the retail price retained by the store.

"Mark-up" is used as a method of arriving at a retail price when costs are more significant than price appeal. "Mark-up" is based upon the cost of goods at wholesale. Now a days price appeal is considered important in retail pricing and is the basis for the 39, 49 and 59 cent prices. "Mark-up" is therefore seldom used.

The following examples will illustrate the difference between the two. A 50-cent retail price is used in these examples, rather than the prevailing 49¢ price merely to simplify the arithmetic. Fractions are rounded to the nearest cent.

a) A store margin of 25% on a 50¢ item at retail is 13¢ - price to grower 37¢. A mark-up of 33% on this wholesale price of 37¢ would result in a retail price of 49¢.

b) A store margin of 33% on a 50¢ item is 17¢ - price to grower 33¢. A mark-up of 50% on this wholesale price would result in a retail price of 50¢.

c) A store margin of 40% on a 50¢ item is 20¢ - price to grower 30¢. A mark-up of 66% on this wholesale price would result in a retail price of 50¢.

d) A store margin of 50% on a 50¢ item is 25¢ - price to grower 25¢. A mark-up of 100% on this wholesale price would result in a retail price of 50¢.

---Fred E. Cole
Professor Emeritus
Department of Agriculture
and Food Economics

/ / / / / / / / / / / / / / / / / /

SIZE AND YIELD OF McINTOSH APPLE TREES ON E.M. II AND VII ROOTSTOCKS

The branch spread of 19 year old McIntosh trees on E.M. II and VII rootstocks was determined by taking two measurements at right angles to each other. Measurements were made from the tip of the outermost branch on one side of the tree to the outermost tip on the opposite side. The average spread of trees on E.M. II was 25 feet. The smallest tree had a spread of 20 feet and the largest tree had a spread of 28 feet. Trees on E.M. VII were a little larger and more uniform in size. The average spread was 29 feet with a range of 27 to 31 feet. No attempt has been made to confine the spread of these trees by pruning. Some heading back has been done in the tops of the trees to restrict tree height. The height of the trees ranges from 12 to 14 feet.

The average annual yield per acre during the past 19 years for trees on E.M. II was 547 boxes per acre, and 619 boxes for E.M. VII trees. These yields were calculated on the basis of a 20 ft. x 30 ft. planting distance for permanent trees. Trees on seedling rootstocks planted 30 ft. x 40 ft. would have to have average yields of 15 and 17 boxes per tree to equal the yields of trees on E.M. II and VII.

The average yield in 1962 for E.M. II was 1447 boxes per acre and for E.M. VII 1483 boxes per acre.

---Walter D. Weeks

/ / / / / / / / / / / / / / / / / /

PROGRESS AT THE HORTICULTURAL RESEARCH CENTER

Renovation of Farm Buildings

Since the Trustees of the University were given the property in Belchertown for our Horticultural Research Center last June, a good deal of work has gone into planting plans, land improvement and preparation. In addition, considerable effort was spent this past winter renovating the existing farm buildings. Although further work remains, we feel that a great deal has been accomplished.

Our foreman, Loren Glazier, and his men plus several from the University maintenance staff have accomplished the following things:

1. Rewired the entire main barn complex.

2. Installed heating units so that all major areas can be kept warm during the winter.

3. Reroofed many areas where it was needed.

4. Laid concrete flooring under the entire main hay barn and cow stanchion area so that we now have an acceptable place to house and service our machinery and vehicles.

5. Installed modern toilet, shower, and lunch room facilities suitable for our personnel and visitors.

6. Remodeled an area at the south end of the buildings to provide office space for our foreman and storage space for small tools and supplies.

A number of smaller jobs too numerous to mention have been taken care of, also. Certainly, those of you who had a chance to visit the Center last summer will now have no difficulty spotting the improvements that have been made in our physical facilities.

---F. W. Southwick

Tree Fruit Plantings

Extensive planting of experimental blocks has not been made at the Horticultural Research Center this spring because trees, which had to be custom propagated last summer, will not be ready for planting until 1964. One small planting was made to study the effects of rates, and placement of fertilizer and lime on the growth of newly set apple trees.

Several East Malling and Malling Merton rootstocks were planted to establish a stool bed.

The large field north of the barn will have some 3,000 feet of drainage tile installed this summer. We plan to set most of this area to apple trees next spring.

---W. D. Weeks

Small Fruit Plantings

Plants of nine named varieties of blueberries and a considerable number of unnamed selections are being grown in a nursery for field planting in the spring of 1964. A variety raspberry planting is being started this spring. Also, a comparison is being made of commercial vs. virus-free stock of raspberries. Strawberry plantings were made to test the yield potential of several named varieties and unnamed selections. Also, an experiment was started to compare the yields of new stocks of virus-free catskill plants with commercially produced superior stock which has a very low virus content.

---John S. Bailey

/ / / / / / / / / / / / / / / / /

FRUIT NOTES

Prepared by Pomology Staff, Department of Horticulture
Cooperative Extension Service, College of Agriculture
University of Massachusetts, Amherst

JULY 8, 1963

TABLE OF CONTENTS

Issued by the Cooperative Extension Service, A. A. Spielman, Dean and Director, in furtherance of the Acts of May 8 and June 30, 1914, University of Massachusetts, United States Department of Agriculture and County Extension Services cooperating.
Publication Approved by Alfred C. Holland, State Purchasing Agent, No. 44.

ANNUAL SUMMER MEETING
of the
MASSACHUSETTS FRUIT GROWERS' ASSOCIATION
in Cooperation with the
COLLEGE OF AGRICULTURE, UNIVERSITY OF MASSACHUSETTS

Orchard of Arthur D. Bishop, Shelburne, Mass.
Thursday, July 25, 1963

Program

10:00 A.M.	Tour of orchards - Arthur D. Bishop, Guide. Items of special interest include: Young McIntosh and Delicious on Malus robusta II, five hardy stocks, and EM VII; weed control and tree mulch plots.
12:00 NOON	Lunch - Sandwiches, dessert and cold drinks will be on sale.
1:30 P.M.	Important Production and Marketing Trends in the Apple Industry. Dr. A. B. Burrell, Peru, New York.
2:15 P.M.	Some Factors to Consider for Late Storage of Apples. Dr. F. W. Southwick, University of Massachusetts.
2:45 P.M.	Crop Prospects for 1963. Mr. A. Warren Clapp, Massachusetts Department of Agriculture.
3:00 P.M.	Apple Promotion Opportunities and Materials. Mr. Rockwood Berry, New York and New England Apple Institute.
3:15 P.M.	Late Season Insect Control. Drs. H. E. Wave and E. H. Wheeler, University of Massachusetts.

How to get there: Mohawk Trail (Route 2) to Shelburne Center, which is approximately 3 miles east of Shelburne Falls. At Shelburne Center road sign turn south and follow "M.F.G.A. Field Meeting" signs to Bishop's Orchard.

CRITICAL FACTORS TO BE CONSIDERED IN AUTOMATING CONTROL OF THE ATMOSPHERE IN C-A STORAGE OF APPLES

Recently, there have appeared on the market, at least two units designed to generate or to control the atmosphere for C-A storages. In evaluating these units for possible installation in existing C-A rooms or in new construction, the following critical factors may provide basis for a decision.

The potential advantages of automating the control of the C-A process are mainly: a savings in labor costs; an increase in reliability; and an operating advantage, in being able to open the C-A room, unload a portion of the produce stored, and then close the C-A room and operate again. The control pattern with these new units may show less variation than with manual control, but the quantitative improvement in fruit quality as a result has not been established.

CA PROCESS HAS BEEN BIOLOGICAL, WITH MANUAL CONTROL

With the CA process, as it is known today, generation of the atmosphere has been achieved primarily by biological means, with chemical absorption towers to aid in the control of the excess CO_2 and nitrogen gas as an aid in reducing oxygen level to operating conditions. The atmospheric composition has been controlled manually by the operator on the basis of an Orsat analysis.

DIFFERENCE BETWEEN MECHANIZATION AND AUTOMATION OF CA

Application of time clocks to program CO_2 towers or to program addition of nitrogen or outside air, represents some mechanization but not automation since self control of the process is not possible by simple mechanization.

Indicator-controllers or recorder-controllers with sensing and control capabilities for humidity, oxygen level, and CO_2 level have been available for some time but their application to automatically control the CA process has been slow due to high initial cost. However, these instruments require periodic calibration, which is usually against an Orsat analysis or a mixture of purchased gases of known composition.

LIMITED AUTOMATION OF CA PROCESS ALREADY ACHIEVED

Of the variables that require control for the CA process (CO_2 level, O_2 level, humidity and temperature), temperature control has already been automated and in a well designed refrigeration system humidity control is inherent. Therefore, any further automation of control must deal with the variables of CO_2 and O_2 levels.

"COME-DOWN" AND "OPERATING" PERIODS IN CA

There are two distinct periods in the operation of a CA storage; the period commonly referred to as the "come-down" when the O_2 level drops from approximately 21% to 3% and the CO_2 level increases to 5% (for McIntosh); and the period commonly referred to as the "operating" period, when the atmosphere is maintained

at a relatively constant composition. Requirements to automate these two periods are different and it should be recognized that the commercial units presently available attempt to generate the required atmosphere as needed or in excess, thus reducing the requirement for relative gas tight room. However, a certain degree of gas tightness is still required and lower operating costs are achieved with a tighter room.

If one generates the required atmosphere, instead of achieving it biologically one is attempting to gain a fruit quality advantage from a rapid O_2 drop. If one generates the atmosphere in excess, he minimizes the need for automatic controls, since the atmosphere generator components can be programmed with time clocks or other devices, although this makes lowest cost operation difficult. The advantage in rapid O_2 drop has not been substantiated at this station in studies over three seasons. However, a rapid O_2 drop has some operating advantage in that a CA room could be opened, partially unloaded and then operated again as CA.

---John W. Zahradnik
Agricultural Engineering Department

/ / / / / / / / / / / / / / / / / / / /

POMOLOGICAL PARAGRAPH

New Publications Available

The following publications have recently been printed and are available by writing to the Mailing Room, University of Massachusetts, Amherst, Massachusetts.

Raspberry Growing. Extension Leaflet 48. Revised May, 1963.

Controlling Weeds in Small Fruit Plantings with Chemicals. Special Circular 215. April, 1963.

Out of Storage Movement and Prices of McIntosh Apples in Massachusetts. Publication 388. January, 1963.

---William J. Lord

/ / / / / / / / / / / / / / / / / / / /

DAMAGE TO BAGGED McINTOSH APPLES IN SHIPPING CONTAINERS BY IMPACT

Shipping tests conducted with Starr apples by F. A. Perkins in New Jersey have shown that placement of the bags within a master carton materially affects the quality of the fruit. Less damage to apples occurred when twelve, 4-pound bags were laid horizontally in two tiers as compared to that occurring in a

container holding twelve pounds of apples vertically in a single tier. Perkins concluded that much of the severe damage on Starr apples was caused by impacts during handling and trucking the apples and not the result of minor vibrations which normally occur in transportation of the fruit.

The study reported below was undertaken to study the relationship between bag placement in master cartons and mechanical damage caused by impacts, where the damage occurs, and how it may be reduced.

Method of Study

All mechanical damage on composited samples of McIntosh apples was encircled with a marking pencil prior to the study. The apples were then jumble-packed in 3 pound capacity polyethylene bags.

The standard procedure of many Massachusetts growers bagging apples is to place 2-½ inch and up diameter apples in the bags. Therefore, in two tests random sized apples were bagged. In another test uniform sized apples were used in comparison to those of random size.

Two types of master containers were used in the study. A fibreboard carton designed to hold twelve 3 pound bags vertically in a single tier. The interior of this carton was divided by non-test C Flute corrugated partitions into 12 vertical cells for additional protection of the apples. The second fibreboard master carton was designed to hold twelve 3 pound bags with 4 bags laid horizontally per layer in 3 layers. A non-test C Flute corrugated pad was placed between the bottom and middle and the middle and top layers of apples. Additional protection was provided by non-test C Flute corrugated partitions which separated the bags in each partition.

In one trial, the effectiveness of a non-test C Flute corrugated partition and ½ inch thick Ethafoam pad (expanded polyethylene product of the Dow Chemical Company, Midland, Michigan) as a means of reducing bruise damage was tested.

The filled containers were dropped 3 times from a height of 12 inches to a wooden floor by a mechanical drop-impact tester. After treatment, the apples were allowed to remain at room temperature for 48 hours to allow the bruised areas to darken. All the fruit in the test were examined for stem punctures and bruises.

Results

In 4 trials, the number of ½ and 3/4 inch diameter bruises was less in cartons with horizontal bag placement than in those with vertical placement (Table 1).

Table 1. Mechanical damage to McIntosh apples in cartons holding twelve 3 pound bags vertically in a single layer in comparison to damage occurring on apples in cartons with four 3 pound bags laid horizontally in each of three layers. Cartons dropped 3 times from a height of 12 inches.

Trial	Bag Placement	Number of Apples	Number of Bruises ½"	3/4"	1"+	Avg. Bruised Area/fruit sq. in.	Apples With Stem Punctures
1961							
1[a]	Vertical	439	295	139	31	.3060	110
	Horizontal	445	219	80	49	.2635	93
2[b]	Vertical	720	488	198	32	.2909	193
	Horizontal	720	293	69	9	.1328	143
1962							
3[c]	Vertical	720	311	184	27	.2282	112
	Horizontal	720	204	81	31	.1397	114
4[d]	Vertical	720	313	164	24	.2131	119
	Horizontal	720	177	62	8	.0954	108

[a]Trial 1; 4 cartons per treatment. Average fruit size 2.93. Flesh firmness - 10.6 pounds.
[b]Trial 2; 6 cartons per treatment. Average fruit size 2.84. Flesh firmness - 10.9 pounds.
[c]Trial 3; 5 cartons per treatment. Average fruit size 2.65. Flesh firmness - 10.9 pounds.
[d]Trial 4; 5 cartons per treatment. All fruit between 2.60-2.70 inches. Flesh firmness 10.8 pounds.

The bag placement had no consistent influence on the number of 1 inch bruises and the number of apples with stem punctures.

The apples used in trial 3 were sized prior to bagging so that each bag contained a similar number of various size fruit. The sizes ranged from 2.30-3.00 inches and averaged about 2.65 inches. The fruit used in trial 4 were from the same lot of composited apples as in trial 3 but were of uniform size (2.60-2.70 inches in diameter). The data in Table 1 show that with the exception of 1 inch bruises for the horizontal bag placement the amount of mechanical damage to the uniform sized fruit did not differ from that on random sized fruit.

More Bruising in Bottom of Cartons

The apples in the bottom of the cartons are subject to severe bruising from the impact of dropping. This is particularly noticeable with the horizontal bag placement since most of the serious damage occurs on the apples in the bottom layer of bags. The data obtained in Trial 1 is used as an illustration of this point (Table 2).

Table 2. Mechanical damage to McIntosh apples by layers in four cartons with four 3-pound bags laid horizontally in each of three layers and dropped three times from a height of 12 inches.

Layer	Apples	Number of Bruises 1/4"	1/2"	3/4"	1"	Avg. Bruised Area/Fruit	Apples With Stem Punct.
	No.					Sq. In.	No.
Top	145	100a*	70a	3a	3a	.1571a	32a
Middle	150	96a	62a	20a	5a	.1969a	31a
Bottom	150	84a	87a	57b	41b	.5252b	30a

*Figures with same letter do not differ significantly.

Bagged McIntosh apples in the bottom layer of the cartons with horizontal bag placement had significantly more 3/4 inch and 1 inch diameter bruises and total bruised area than the upper two layers. There was no significant difference in the damage to the apples in the top and middle layers. The number of stem punctured apples did not differ significantly between the three layers.

The surface of 90 per cent of the apples in contact with the container bottom was bruised with 30 per cent being 1 inch in diameter or larger.

Additional Protection Reduces Bruising

A pad of 1/4 inch Ethafoam or a corrugated partition placed on the bottom of master cartons, holding four 3-pound bags in each of three layers, reduced the incidence of 1 inch diameter bruises and the average bruised area (Table 3).

Table 3. The effect of additional protection against mechanical damage from impact to McIntosh apples in twelve 3-pound bags in four cartons with four 3-pound bags laid horizontally in each of three layers. The cartons were dropped three times from a height of 12 inches.

Protection Given Bottom of Carton	No. of Cartons	No. of Apples	Number of Bruises 1/4"	1/2"	3/4"	1"	Avg. Bruised Area/Fruit	Apples w/Stem Punct.
							Sq. In.	No.
None	4	445	280a*	219a	85a	49a	.2930a	93a
Corr. Pad	4	431	234a	196a	67a	25b	.2294b	106a
" Ethafoam	4	435	210a	165a	56a	9b	.1741c	95a

Figures with same letter do not differ significantly.

The only bruises found on the apples surfaces in contact with the Ethafoam were three ½-inch bruises. However, Ethafoam probably is too expensive for grower use as a means of reducing impact damage.

The number of apples with stem punctures was not influenced by the treatments.

Summary

Bagged McIntosh apples in master containers are seriously bruised when the apples are dropped. This study showed that horizontal bag placement in comparison to vertical placement will reduce bruising caused by impact.

The apples in the bottom of the cartons are subject to severe bruising from the impact of dropping. This is particularly noticeable with the horizontal bag placement since most of the serious damage occurs to the apples in the bottom layer of bags.

The use of pads as a means of increased protection to the bottom layer of fruit reduced bruising.

---William J. Lord

/ / / / / / / / / / / / / / / / / / / /

POMOLOGICAL PARAGRAPH

Storage Holdings

A record has been kept of the Apple Storage Holdings on October 15 and November 1 from 1933 through 1962 in Massachusetts and of the New England and New York CA Holdings from 1956 through 1962. A copy of this information may be obtained from the Editor of Fruit Notes.

---William J. Lord

/ / / / / / / / / / / / / / / / / / / /

BORON FOR PEACH TREES

It would appear that boron should not be applied to peaches unless a real deficiency occurs. Boron deficiency symptoms in the peach are characterized by failure of both leaf and flower buds to "break" normally when spring growth starts. The buds remain alive until full bloom and turn brown and die. Stem tissue may appear normal for two or three weeks after the buds die.

We have no evidence of boron toxicity occurring in Massachusetts peach orchards. However, reports from North Carolina and New Jersey indicate that the peach is more sensitive to excessive applications of borax than the apple.

In North Carolina annual applications of 1/8 and 1/4 pound of borax per tree were made to Georgia Belle peach trees. Fruit from trees receiving the 1/4 pound rate was characterized by earlier ripening, a reduction in red coloration, insipid fruit flavor, and a softer more mealy texture. The 1/8 pound rate per tree appeared to be close to the maximum tolerance of the trees.

In New Jersey 3/4 pound of borax per tree hastened fruit maturity, fruit flavor was flat and insipid and fruit was poorly colored with many split pits.

Tree symptoms of excess boron are characterized by withering and dying back of terminal shoots in mid and late season, small canker areas along the shoots, rough bark, prominent lenticels, excessive development of lateral shoots which gives a bushy type growth.

---Walter D. Weeks

/ / / / / / / / / / / / / / / /

RESPONSE OF RASPBERRIES TO THE WINTER OF 1962-63

As is indicated in the following table, there was very little winter injury to the raspberry plants in our variety planting at Amherst. None of the injury was of commercial significance as normal heading-back of the canes would eliminate most of the injured wood.

Estimate of Cane Killing of Raspberries 1962-63

	% of Cane Killed		% of Cane Killed
Canby	10.0	Milton	2.0
Comet	2.0	Muskoka	2.0
Durham	0.0	New Hampshire	1.0
Early Red	2.0	N.H. #56-2	2.0
Gatineau	2.0	September	1.0
Lake Geneva	2.0	Sumner	3.0
Latham	1.0	Thames	2.0
Madawaska	0.0	Success	2.0

---James F. Anderson

/ / / / / / / / / / / / / / / /

FRUIT NOTES

Prepared by Pomology Staff, Department of Horticulture
Cooperative Extension Service, College of Agriculture
University of Massachusetts, Amherst

AUGUST–SEPTEMBER, 1963

TABLE OF CONTENTS

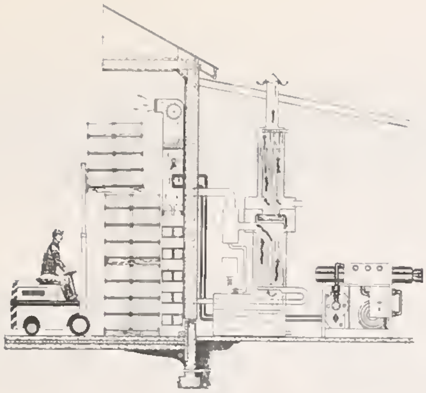
Issued by the Cooperative Extension Service, A. A. Spielman, Dean and Director, in furtherance of the Acts of May 8 and June 30, 1914, University of Massachusetts, United States Department of Agriculture and County Extension Services cooperating.
Publication Approved by Alfred C. Holland, State Purchasing Agent, No. 44.

COUNTY EXTENSION AGENTS IN SUPPORT OF THE FRUIT PROGRAM

BARNSTABLE	Oscar S. Johnson, County Extension Agent in Agriculture, Cape Cod Extension Service, Barnstable (Tel. FOrest 2-3255)
BERKSHIRE, FRANKLIN, HAMPDEN and HAMPSHIRE	G. Everett Wilder, Pioneer Valley Extension Agent in Agriculture, Hampden County Improvement League, 1499 Memorial Avenue, West Springfield (Tel. Springfield REpublic 6-7204)
BRISTOL	Harold O. Woodward, County Extension Agent in Agriculture, Bristol County Agricultural School, Center Street, Segreganset (Tel. Dighton NOrmandy 9-3611 or 9-2361)
DUKES	Ezra I. Shaw, County Extension Agent in Agriculture, Dukes County Extension Service, Vineyard Haven (Tel. Vineyard Haven 694)
ESSEX and MIDDLESEX	Max G. Fultz, County Extension Agent in Agriculture, Middlesex County Extension Service, 19 Everett Street, Concord (Tel. Concord EMerson 9-4845)
NORFOLK	Howard Wilson, County Extension Agent in Agriculture, Norfolk County Agricultural School, 460 Main Street, Walpole (Tel. Walpole MOntrose 8-0268 or 8-0269)
PLYMOUTH	Dominic A. Marini, County Extension Agent in Agriculture, Plymouth County Extension Service, Court House, Brockton (Tel. Brockton JUniper 6-4993)
WORCESTER	William R. Goss, County Extension Agent in Agriculture, Worcester County Extension Service, 36 Harvard Street, Worcester (Tel. Worcester PLeasant 3-5477)

All pesticide chemicals mentioned in this publication are registered and cleared for the suggested uses in accordance with federal laws and regulations. Chapter 727, Acts of 1960, Commonwealth of Massachusetts requires that all pesticides sold in Massachusetts be registered with the Massachusetts Department of Public Health. Trade names, where used for clearness, do not indicate endorsement nor imply that similar products are not satisfactory.

WARNING! MOST PESTICIDES ARE POISONOUS. READ AND FOLLOW ALL DIRECTIONS AND SAFETY PRECAUTIONS ON LABELS. HANDLE CAREFULLY AND STORE OUT OF REACH OF CHILDREN, PETS AND LIVESTOCK.



Agricultural Engineering

COMPRESSOR LOW-SIDE CONTROL ADJUSTMENT FOR HIGH RELATIVE HUMIDITY IN CA ROOMS

In view of the fact that most humidistats presently available are designed to operate in the range of 30-70 per cent relative humidity and good control at 85-90 per cent relative humidity is difficult, a practical solution to maintain at least 85 per cent relative humidity is as follows:

1. Thoroughly wet down boxes and fruit on loading.

2. Use mist nozzles to saturate the air as it leaves the refrigeration cooling coils.

3. Periodically measure R.H. by means of a wet and dry bulb thermometer and operate mist nozzles accordingly.

4. Adjust the low pressure (suction side) control on the compressor, so that at CA room operating temperatures of $37^{\circ}F \pm 1\frac{1}{2}^{\circ}F$, the outside surface temperature of the refrigeration cooling coils does not fall below $34^{\circ}F \pm 1\frac{1}{2}^{\circ}F$. This coil surface temperature will prevent the R.H. from dropping below 85% once it has been attained. The table following gives the suction pressures corresponding to $34^{\circ}F$ for the two most commonly used refrigerants in CA rooms.

	Low side gage pressure corresponding to $34^{\circ}F$.	
Refrigerant	Theoretical	Allowance for 3° temp. diff. inside to outside of coil
Freon 12	31.7 psi	29.3 psi
Ammonia	50.2 psi	46.3 psi

Use of these small temperature differences between the inside of the coil and the room will reduce the Btu capacity of the coil to about 30% of what most coils are designed for. This should be of no serious consequence, since the maximum cooling load on the coil is during loading and initial cooling. The change in low side cutout recommended above would take place after this peak load has passed.

One possible complication might result in a situation where one compressor was used simultaneously on a 37°F CA room and on a 32°F cold storage where lower low side pressures corresponding to a coil temperature perhaps below 32°F would be required. In this case, a back pressure regulating valve would be required on the low side line from the coil in the CA room.

---John W. Zahradnik
Agr'l. Engineering Department

/ / / / / / / / / / / / / / / /

POMOLOGICAL PARAGRAPH

Report Storage Holdings Promptly

At a recent meeting of the Marketing Committee of the Massachusetts Fruit Growers Association, growers complained about the delays in learning about prices and storage holdings. Warren Clapp, who was present, explained that a few growers are consistently slow in making their reports. The Marketing Committee urges these few growers to improve their reporting. There is no need to use up public funds that we need elsewhere for follow up phone calls and most important it is unfair to delay information reaching your fellow growers.

Our only salvation in fruit growing is in working together to do a better job. Remember if you hold your information for a phone call, you are costing us all money and loss of time.

---Marketing Committee

/ / / / / / / / / / / / / / / /

SCALD CONTROL FOR 1963

Scald control for our varieties is not simply a question of what chemical to apply. Scald varies tremendously with variety (sometimes between strains of a variety), the type of growing season experienced, maturity of the fruit when harvested, period of time from harvest to storage, how it is stored (regular cold or CA) and how long it is to be stored. Because of the importance of the above factors in the development of scald the blanket use of Stop-Scald (ethoxyquin) or DPA (diphenylamine) on all stored apples is not warranted. In addition, neither

of these materials is so reliable that its use guarantees scald control. In years such as 1959-60, unusually hot weather during August and September may markedly increase the susceptibility of some varieties to this disorder.

The Available Materials

STOP-SCALD (ethoxyquin)

This material should be used after harvest at the rate of 3 pints per 100 gallons of water (2700 ppm.). It has a residue tolerance of 3 ppm. Preharvest tree sprays are not advised because of the common appearance of dark-spot, residue marks on the fruit and they may be considerably less effective than post-harvest dips, sprays, or flooding applications. Also, Stop-Scald is generally inferior to DPA for scald control on Cortland and Delicious. Stop Scald's chief advantage over DPA is that it is not as apt to cause surface injury to fruit that is box or bin flooded or dipped. This material has no ripening action on stored fruit. Do not apply to fruit more than once. Allow fruit to drain well after treatment. Keep the solution well agitated. A 100 gallon batch can be expected to treat about 1000 bushels of fruit. All fruit treated after harvest must carry the label "Ethoxyquin treated to retard spoilage". The lettering must be as large as other grade labels.

DPA (diphenylamine)

This material will be sold as a 55% and 83% formulation. Except for a few varieties that are somewhat susceptible to DPA injury it should be applied at the rate of 2000 ppm. (2 pounds of the 83% or 3 pounds of the 55% formulation). Solutions for use on Rome Beauty and Baldwin should be reduced to 1000 ppm. (1 pound of the 83% or 1 1/2 pounds of the 55% formulation) to reduce the chances of injury to the fruit. The residue tolerance is 10 ppm. This material is generally more effective for scald control than any other known chemical method on most varieties.

a. Preharvest DPA Sprays

In Massachusetts tests dilute (1X) sprays have been nearly as effective as post-harvest treatments. The fruit must be harvested within 36 hours following treatment to be effective, however. Thorough coverage of the fruit surface must be obtained. Do not apply sprays when temperatures are 80°F or higher. Do not make repeat applications with DPA unless a heavy rain occurs between a tree application and harvest. Apply DPA separately as a dilute (1X) spray.

b. Post-Harvest DPA Treatments

Keep the suspension well agitated. A 100 gallon batch can be expected to treat 1000 bushels of fruit. Excellent drainage of excess DPA suspensions is necessary to avoid collection of liquid material around the fruit in the bottom of containers when crate or bin-dipping, spraying or flooding is practiced. Those who work with DPA should use rubber gloves and avoid inhaling the DPA dust. DPA can be applied to fruit wraps and used for scald control by those interested in wrapping each apple. This chemical has no apparent ripening action on stored apples. All fruit treated after harvest must have a label on the shipping container stating, "Treated with diphenylamine to retard spoilage" in letters as large as the grade labels used on the package.

VARIETAL SUGGESTIONS

McINTOSH

Results of the past 5 years at Amherst show that McIntosh placed in CA storage will not scald appreciably through April. This statement is predicated on the assumption that the fruit is picked at a flesh firmness of 15 to 17 pounds (Magness-Taylor tester with 7/16 inch head), moved from the orchard to storage within 24 hours and cooled to 32°F promptly. CA storage may not always control scald on this variety indefinitely but only delay the time of its appearance. Consequently, some scald may develop on some lots of CA McIntosh in May or June which were entirely free from it earlier. It is suggested that DPA, if used at all on McIntosh, be applied only to those lots of fruit held into May and June.

Scald on regular cold storage McIntosh is generally not a problem until after January at which time the bulk of this fruit should have been sold. Our results with DPA or Stop-Scald have not been outstanding for controlling scald on McIntosh held beyond January in regular cold storage.

CORTLAND

In contrast to McIntosh, CA storage often increases the severity of scald on Cortland in comparison to regular cold storage. Cortland keeps exceedingly well in CA (same requirements as McIntosh) except for scald. Therefore, chemical treatment with scald inhibitors is a necessity if Cortland are to be stored in CA or beyond January 1 in regular cold storage. DPA is distinctly superior to Stop-Scald on this variety. In years when mean temperatures are well above average for 6 weeks or so before harvest, even DPA may not control this disorder adequately. However, DPA may be expected to provide sufficient scald control in most years so that Cortland may be considered for trial in commercial CA rooms.

DELICIOUS

Results obtained with this variety indicate that CA may reduce scald on Delicious sometimes but the reduction may not be great enough to eliminate the need for scald control chemicals in some years. This variety is so valuable that DPA is suggested for fruit (particularly the early picked, less mature fruit) placed in CA or to be stored beyond January 1 in regular cold storage.

ROME

During the past two seasons CA storage alone has provided commercial scald control on the Romes harvested after October 10. However, DPA is suggested at 1000 ppm. (1 pound of the 83% or 1.5 pounds of the 55% formulation) as a preharvest treatment (since 2000 ppm. may occasionally cause some fruit injury) to Romes held in regular cold storage beyond January regardless of when they were picked. Stop-Scald is probably more suitable than DPA as a post-harvest treatment for Rome since it controls scald well and is less apt to injure the fruit than DPA. Work from other areas indicate that the suggestions given for the chemical treatment of Rome apply equally well to Baldwin.

---F. W. Southwick

/ /

POMOLOGICAL PARAGRAPH

Large Apples Have No Place in Polyethylene Bags

At a recent Marketing Committee Meeting of the Massachusetts Fruit Growers Association there was a discussion of how to handle large size apples, especially McIntosh. After considerable talk by committee members who are packers and after seeing and hearing reports by Fred Cole and Bill Lord (See Table below) it was unanimously agreed that 3" Macs do not belong in poly bags. They bruise, break down and generally discourage repeat sales for Macs.

The best solutions offered were cell cartons or overwrap trays. However, in the case of the trays, it was urged that packers remember that overwrapping is expensive, the apples are brought for eating out of hand, and that Mrs. Consumer expects to pay more for them; therefore, nothing should happen to down-grade the fruit in these packages.

The following table from a recent study by F. E. Cole and W. J. Lord (Selling Apples to Retail Food Stores - Publication 380) substantiates the statements above.

Table 1. Relationship between fruit size of McIntosh apples in retail stores and per cent of apples below U. S. No. 1 grade because of bruises, November and December 1960.

Size (Inches)	Per Cent in Grade	Per Cent of Apples Below Grade Because of Bruises
Over 3 inch	36.4%	85.7%
3 inch	46.8%	67.1%
2 3/4 inch	50.2%	63.2%
2 1/2 inch	60.3%	51.0%
2 1/4 inch	78.5%	35.0%

---Marketing Committee

/ / / / / / / / / / / / / / / / / /

THE HARVEST AND STORAGE OF DELICIOUS APPLES

Water core and internal breakdown of Delicious apples was a major problem during the 1962-1963 storage season. Because of the prevalence of water core at harvest, some growers did not hold some lots of Delicious for late storage. As the storage season progressed, it became apparent that these growers made a wise decision and avoided considerable financial loss.

The disappearance of water core and the occurrence of internal breakdown appears to be related to the severity of water core at harvest. In 1926, Brooks and Fisher of the U. S. D. A. stated that picking at the proper stage of maturity is the most practical preventive now known for water core. This statement still holds true in 1963.

The data presented in Table 1 indicate that, under conditions at Amherst, Delicious should be picked before mid-October in order to minimize storage losses due to internal disorders. Unfortunately, storage scald may be a problem in some years. For example, the data in Table 1 show that only 4.1 per cent of the Starking Delicious harvested on October 9, 1961 had internal disorders after storage plus 7 days at room temperature. However, 21 per cent of these fruit had storage scald.

Table 1. Per cent of Starking Delicious having water core at harvest in 1959-1962 and per cent having internal disorders and scald after regular 32° storage and seven days at room temperature.

Picking	Apples with Water Core at Harvest				After Storage Plus 7 Days at Room Temp.[1]	
Date	Slight	Medium	Severe	Total	Int. Disorder	Scald
1959	%	%	%	%	%	%
10/1	21.1	0.0	0.0	21.1	3.6	---
10/15	48.3	9.3	1.5	59.1	23.1	---
10/29	37.0	9.2	25.0	71.2	28.6	---
1960						
9/29	22.2	5.1	1.3	28.6	0.9	7.6
10/10	24.7	8.0	15.6	48.3	19.6	0.0
10/20	40.7	3.7	6.3	50.7	10.5	0.0
1961						
9/29	0.0	0.0	0.0	0.0	0.4	42.7
10/9	3.5	0.4	0.0	3.9	4.1	21.3
10/24	48.0	5.5	4.6	58.1	35.3	0.3
1962						
9/28	17.9	0.0	0.0	17.9	0.5	6.0
10/10	19.4	9.0	9.0	37.4	44.9	0.0
10/24	24.3	14.3	39.1	77.7	76.8	0.0

[1]Stored until: 1959 - 3/7/60; 1960 - 3/2/61; 1961 - 4/3/62; 1962 - 4/1/63.

Growers should watch the maturity of Red Delicious apples carefully. Under the conditions at Amherst, Richared Delicious apples appear to be more susceptible to water core than those of the Starking strain. The amount and severity of water core may be observed by sampling and cutting the more mature Delicious apples on the tree. The fruit should be harvested before or while the disorder is limited to a series of small water-soaked spots bordering the primary vascular bundles. However, growers should plan to treat the Delicious held for late storage with DPA for scald control.

Storage tests conducted during two seasons failed to show any consistent effect of CA, in comparison to regular storage on the severity of scald of Richared and Starking Delicious apples. However, CA storage may reduce the severity of internal breakdown of both Richared and Starking Delicious apples having considerable water core at harvest.

---William J. Lord

/ / / / / / / / / / / / / / / /

W A R N I N G

T H I S is for Y O U - the food or feed producer.

Y O U are L E G A L L Y responsible for the C H E M I C A L R E S I D U E S that remain in or on Y O U R produce. (Fruit, vegetables, milk, meat, eggs, feed etc.)

Avoid I L L E G A L R E S I D U E S by following D I R E C T I O N S on L A B E L S and in P E S T C O N T R O L C H A R T S, and preventing D R I F T to other crops. You cannot cover up an illegal residue so chemists can't find it.

K N O W what you are using! K E E P a L A B E L with a list of Active Ingredients. (Trade names are not enough)

K E E P a R E C O R D. It will show FDA inspectors that Y O U are reliable, cooperative and K N O W what you are doing.

Massachusetts growers have a good record to date. Let's apply chemical pesticides as they should be used and continue to produce a safe, wholesome product.

S T A Y A L I V E - protect yourself and your help.

R E D S K U L L and C R O S S B O N E S and the R E D word P O I S O N are used only when the danger is great. Seeing these on a label means B E C A R E F U L - really careful.

---E. H. Wheeler
Department of Entomology
and Plant Pathology

A LABOR SAVER

Easy Way to Unload Trailer

An easy way of unloading a trailer of apples has been devised by a Massachusetts grower. Two roller conveyors are placed on the platform of a flat bed trailer. On the conveyors are placed 3 pieces of plywood 5/8" x 37 1/2" x 69" and one piece 5/8" x 18 3/4" x 69". Since leveling takes place at the unloading dock, the trailer is loaded with one layer of 35 boxes.

Sliding of the conveyors and plywood off the trailer is prevented by a $3\frac{1}{2}$ x $3\frac{1}{2}$ plank having two bolts that protrude and fit in holes bored in the trailer bed.

To unload the boxes of apples the trailer is backed up to a platform at the unloading dock. The platform with two roller conveyors on it is at the same height as the trailer bed. The retaining plank is removed and the trailer is quickly unloaded by grasping the boxes at the front of the trailer and sliding the load onto the platform. Another set of plywood boards are placed on the trailer and the driver is off for another load of apples without any further delay.

The platform is of sufficient size to hold $2\frac{1}{2}$ trailer loads of apples. This also helps eliminate waiting at the unloading dock.

The boxes are leveled by women and then a man places them on a skid for storage.

---William J. Lord

/ / / / / / / / / / / / / / / / / / / /

FRUIT NOTES

Prepared by Pomology Staff, Department of Horticulture
Cooperative Extension Service, College of Agriculture
University of Massachusetts, Amherst

SEPTEMBER 20, 1963

TABLE OF CONTENTS

Issued by the Cooperative Extension Service, A. A. Spielman, Dean and Director, in furtherance of the Acts of May 8 and June 30, 1914; University of Massachusetts, United States Department of Agriculture and County Extension Services cooperating.
Publication Approved by Alfred C. Holland, State Purchasing Agent, No. 44.

MAILING LIST REVISION

In accordance with penalty mailing regulations, the mailing list for Fruit Notes is being revised. Enclosed with this issue is a return card for you to indicate if you wish to remain on the mailing list. Return this card promptly so as not to miss the next issue of Fruit Notes to be mailed in November. Persons receiving this periodical by subscription will not receive a card, but will be sent the usual renewal notice at the time their subscription expires.

All pesticide chemicals mentioned in this publication are registered and cleared for the suggested uses in accordance with federal laws and regulations. Chapter 727, Acts of 1960, Commonwealth of Massachusetts requires that all pesticides sold in Massachusetts be registered with the Massachusetts Department of Public Health. Trade names, where used for clearness, do not indicate endorsement nor imply that similar products are not satisfactory.

WARNING! MOST PESTICIDES ARE POISONOUS. READ AND FOLLOW ALL DIRECTIONS AND SAFETY PRECAUTIONS ON LABELS. HANDLE CAREFULLY AND STORE OUT OF REACH OF CHILDREN, PETS AND LIVESTOCK.

FEATHERED FRIENDS OR FOES

There is no doubt in the minds of most individuals, whether gardeners, farmers, or bird watchers, that birds in general are beneficial to mankind. Nearly all species at one time or another are insect or weed-seed eaters; and some subsist entirely on these foods. However, some compete directly with man for food, thereby causing considerable amounts of economic damage to fruits, small grains, truck crops, and to the livestock and poultry industries.

In the New England area, bird depredations to agricultural crops generally take place at two distinct times of year. First, great losses occur when tree fruits and berries ripen. Usually at this time damage is also occurring to sweet corn and other garden crops. A second loss occurs during severe winter months when groups of winter resident birds utilize poultry, mink, pheasant, and cattle feed areas to obtain food. Each type of damage, whether occurring in the summer or winter, is usually a unique problem and may be caused by a variety of birds, depending on surrounding habitat, season of the year, and product involved.

Little is known as to why agricultural products in this area are apparently receiving more depredations today than ten years ago. Several theories have been advanced: (1) reduction of desirable feeding habitat for birds because of increased building; (2) reduction in numbers of farms, thereby concentrating birds at remaining farm areas; (3) a decrease in available insects that birds normally eat due to the increased use of insecticides; and (4) a population increase in some species of birds. It seems logical to assume that all of these factors have contributed to greater bird depredations during the last few years and that no one factor is responsible for the problem.

Contrary to what most farmers believe, there are comparatively few bird species causing crop depredations in the New England area. However, these few cause considerable damage each year. When all agricultural crops are considered, the six most troublesome species are: starlings, robins, Baltimore orioles, red-winged blackbirds, grackles, and catbirds. Other bird species are pests at times, but usually only isolated problems involving these species occur. Of the six mentioned, starlings, red-winged blackbirds, grackles, and Baltimore orioles are in the blackbird group; the remaining three are classified as songbirds.

Of the species mentioned, only the red-winged blackbird is not a serious depredator of fruit. However, red-winged blackbirds have gained unfavorable reputations because of the amounts of damage that they cause to sweet corn plantings. Other truck crops,. for instance peas, squash, onions, may be damaged by birds--but due to small acreages and other more preferred foods, damage of this sort is minute.

Bird damage to agricultural crops is difficult to alleviate or prevent. Many of the species involved are protected by Federal and State laws, but even if they were not control would be difficult--for each situation varies according to habitat, species and numbers. Those species that are not protected may be destroyed, but usually they are in such numbers that destruction of a few serves no purpose. Even so, it might prove beneficial if unprotected problem bird species were reduced, if such a reductional program covered a large geographical area. But this type of program cannot be advocated until much more is learned about the habits of the bird species involved.

To date, there appears to be at least two courses open to an individual whose crop is jeopardized. He may exclude the birds from the crop by covering it or he may use some type of scaring device. Exclosures made of lasting material and erected properly are birdproof, resulting in complete protection. However, they are expensive and impractical unless used on small acreages on a high-income crop.

Small fruits, such as blueberries, strawberries, and grapes lend themselves to the exclosure type of protection. Other crops, such as small grains, and peaches cannot be covered economically. Therefore, scaring devices must be employed where bird losses are heavy. Scaring devices do not eliminate bird depredation, but they do help in reducing amounts of damage. However, it must be remembered that scaring devices are most effective on flocking bird species; hence, starlings are much more apt to be deterred with noise than robins or orioles. The effectiveness of a scaring device depends on habitat, crop to be protected, species causing damage, type of device, and manner in which it is used.

The U. S. Fish and Wildlife Service is fully aware of the seriousness of bird problems and is currently conducting basic research and field investigations to develop ways and means of effectively combatting these problems. In order to be acceptable, control methods must be selective so that only the culprits responsible for the damage will be punished. Also, control methods must be safe--presenting a minimum hazard to humans and desirable animals and birds.

---Richard N. Smith
U. S. Fish and
Wildlife Service

/ / / / / / / / / / / / / / / / / / / /

POMOLOGICAL PARAGRAPH

Picker's Tapes

Growers are making good use of picker's tapes not only for tallying the number of boxes harvested by each picker but as a means of determining who picked the apples and from what block of trees they were harvested.

Every morning during harvest the orchard foreman gives each picker a roll of the tape which is used to identify the boxes harvested by each picker. A serrated section having the picker's number and the box number is fastened to a top edge of each apple box.

In one orchard, the foreman keeps a daily record of: (a) names of pickers; (b) the date; (c) the name or number of the section of the orchard being harvested; (d) the first box number on the tape handed to each picker in the morning; (e) the box number on each tape at the end of the day; and (f) the results of the bruise count made by the checker. By inspecting the tape the grower can determine the above data for any box during harvest, storage, or packing period.

APPROVED FARM STAND MEETING

The summer meeting of the program members was held on August 15th at the Waseeka Farm in Ashland, at which time there was a free exchange of ideas and discussion of selling at farm stands. To some program participants the meetings, inspections and price reports are the principal benefits of the program rather than the Approved Farm Stand Sign.

A brief review of United States Grades of Apples was made to clarify some points in question. It was emphasized that "Drops" (an apple that shows evidence of having been on the ground) is not an official grade classification. Drops should be sold unclassified or as Drops (Unclassified) for the benefit of the customer.

A drop could be placed in one of the numerous grade classifications if it shows no evidence of having been on the ground and meets the grade requirement. However, drop McIntosh without bruises are rare.

There appears to be some misunderstanding concerning the requirements of the Utility grade. Utility is a good grade of apples and not a home for culls. The Apple Sorters Manual which can be obtained from your County Agent specifies grade requirements.

The availability of only plastic cartons in the future is of major concern to the participants of the Approved Farm Program. The problem with plastic cartons for cider is that of sealing. Many operators have found only stapling the wax containers was unsatisfactory and used a sealing device. At present, no economical sealing device is available for plastic cartons. It seemed to those present at the meeting that a top fold or other device for closing could and should be developed for plastic cartons. At present the plastic carton is considered to be unusable.

It appeared to be the opinion of the group that careful consideration should be given to including "All apples must be clean" as a future regulation of the Approved Farm Stand Program. The term "clean" to mean free from apparent residue or dirt.

During the discussion of special displays and decorations it was emphasized that all displays and decorations should be built to promote apples. There are only a few items that you can sell at the orchard roadside stand without taking something away from the principal product - apples.

---William J. Lord

/ / / / / / / / / / / / / / / / /

POMOLOGICAL PARAGRAPH

Know the Condition of Fruit in Storage

The use of picker's tapes, chalk or other devices to mark stored boxes of fruit is worthwhile. Jordan H. Levin, Head, Fruit and Vegetable Harvesting

Investigation, ARS, USDA, Michigan State University, East Lansing, Michigan stated at the Conference on Factors Affecting Fruit Condition held in February 1961 at Rutgers - The State University, New Brunswick, New Jersey, "One simple practice which I feel everyone who stores fruit should follow is to label each box or lot with the date of harvest. The fruit should be put in storage so fruit at proper maturity could be taken out last, and overripe fruit and fruit picked at an early stage of maturity taken out first. Few growers realize the importance of maturity to storage life and fruit condition and thus fail to take the little time necessary to keep such records."

---William J. Lord

/ / / / / / / / / / / / / / / / / /

THE MORSES' "BIG APPLE"

Any fruit grower who knows a peach of an operation will drool over this Norfolk County family enterprise which is rapidly growing into the largest fruit farm in the area. The Big Apple fruit farm located on Arnold Street in Wrentham, Massachusetts has been built into a thriving family-run retail business and is under the supervision of son, Peter, a Stockbridge School graduate. Apples, peaches, pears, apricots, strawberries and blueberries are produced for sale at the stand.

Although Arnold Street is a side road, the use of signs draws a fine retail business to the farm stand and cider mill which are in a converted barn. A 100% retail business has been built up and cider has become one of their major items.

At first, the Morses were buying cider from other mills but transportation costs were prohibitive. Although cider was a convenience item for customers, the demand was so great that the Morses felt that the loss should be turned into profits by installing their own mill.

Preparations for the new mill began in 1959 by investigating all types of cider mills. In 1960 they toured through New York state searching for ideas for a press. After a long search, it was decided to get what they considered the best press on the market. Their conclusion was the Willmes Press.

The Willmes Press is basically an inflatable rubber bag, which squeezes the juice from the fruit. This German-made press is filled with pomace in the horizontal cylinder, which consists of a slotted screen periphery enclosed in an open housing of cylinder ribs. The press is closed, the bag inflated and the pomace squeezed outward against the slotted screen.

The operation cost $15,000 to install and took three years to construct and work the "bugs" out to where it is now a one-man, semi-automatic operation.

All apples are cooled and washed before grinding and then rice hulls are mixed with the apples during the grinding process to prevent packing in the press and permit easier juice flow. Pomace is exchanged with dairymen for manure.

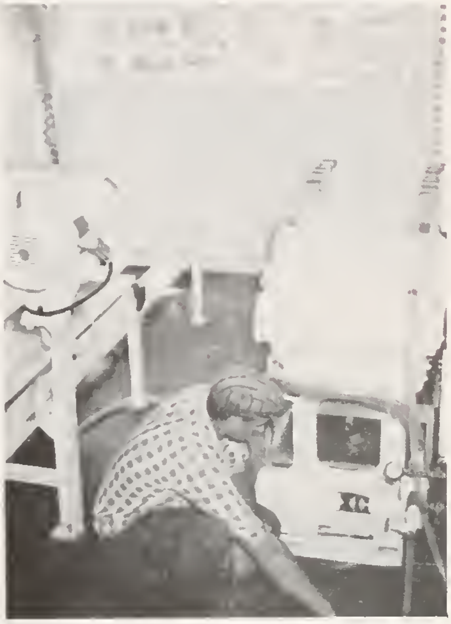
The yield of cider in peak season is 4 gallons per bushel and 3 1/2 in winter, an extra gallon over conventional presses. The press holds 25 bushels of pomace per cycle of 20 minutes. The low-operating expense has also increased profits.

The stand's volume of 75 gallons a week has increased 300% to about 250 gallons a week the first year. Season is from early harvest to early spring.

Everything is packaged in waxed cartons from 1/2 pints to quarts and 1/2 gallons. Glass jugs are filled if customers bring them.

The Morse family is happy on their 50-acre fruit farm, and we mean the whole family - Mr. & Mrs. Morse, Peter Thomas Jr., Greg and Stephen. They all contribute time and plenty of energy to make the Big Apple a big success.

Peter Morse has travelled widely in search of ideas and has one of the most mechanized operations around. Whether it's a self-propelled aerial picker-pruner or weed control sprayers, Pete makes them himself in their own shop.



Pete Morse points out the filter press and pumps. One pump is used just for the filter. The other pump has two valves on the intake side and two on the discharge end which allows the pump to be used for two pumping jobs.

Pete Morse shows the juice tray which is rolled out of the way when the cylinder is tipped to allow the pomace to drop to the take-away auger below.

Outside of the mill: at left bulk bin used for storing rice hulls and air compressor with gas engine. Inside of the mill: Filter Press and Willmes Presser. Foreground is pomace auger.

---Howard Wilson
County Extension Agent in Agriculture
Norfolk County

HOW TO MAKE CALLS TO THE UNIVERSITY

Growers wishing to call some member of the University staff can now dial their party directly without going through the central switchboard. University personnel may be reached directly by prefixing their present extension by 545-2. The new telephone numbers of the Pomology Staff and Department of Entomology and Plant Pathology members frequently called are:

Prof. John Bailey	- 545-2244
Dr. Constantine Gilgut	- 545-2280
Dr. William Lord	- 545-2248
Dr. Frank Southwick	- 545-2244
Dr. Herbert Wave	- 545-2284
Dr. Walter Weeks	- 545-2244
Dr. Ellsworth Wheeler	- 545-2280

---William J. Lord

/ / / / / / / / / / / / / / / / /

ORCHARD MOUSE RECOMMENDATIONS--FALL 1963

Orchard mice can be controlled by placing poisoned baits in mouse trails by hand, broadcasting, or by using the trail builder machine.

The BROADCAST METHOD is fast and very effective for MEADOW MICE that feed and travel on the surface. A man can hand bait an orchard about as fast as he can walk the tree rows. Forcibly throw a small handful of bait into the matted grass within the drip area of the tree. Be sure to treat both sides of the tree row. Baiting should be done when the grass is dry so the bait will sift through where the mice can readily find it. A hand or tractor-drawn seeder is faster and also does an effective job. The recommended rate of application varies between 6 and 10 pounds per acre, depending on density of ground cover and the severity of the mouse infestation. The method is not recommended for controlling pine mice because of their subsurface activities and habits.

HAND BAITING, although slow and laborious, is still a good control method for PINE MICE on small acreages. For large acreages, a MECHANICAL TRAIL BUILDER produces good results. Both the Zinc Phosphide Rodenticide-treated apples and the Zinc Phosphide-treated Steamed-crushed Oats should be used for this species. When using the Trail Builder, make parallel applications on each side of the tree within the drip area of the tree. Four to six pounds of bait per acre should be used. When using any poisoned bait, the importance of favorable weather during treatment and for at least two days following cannot be overemphasized!

We do not recommend the use of ENDRIN for controlling orchard mice in Massachusetts orchards for several reasons. The results achieved with Endrin applications in most cases do not justify the additional expense. Secondly, there is a very real danger of contaminating wells and public water supplies in hilly terrain, especially when using a residual, highly-toxic material. Care should be exercised not to spray vegetation that will be consumed by domestic animals. Also, any drops present during spraying should not be harvested or used for human or animal consumption. Since Endrin is highly toxic to fish at very low concentrations, this material should not be used where it may drain into farm ponds or state stocked waters. If used, careful adherence to label restrictions must be followed and the orchard should be posted.

HERBICIDES are being used increasingly to control vegetative growth near trees. This will be helpful in reducing mouse infestations. However, growers should check carefully to determine the infestation of mice before winter sets in. Mice may do severe damage under snow cover; hence, it is important to get the orchard treated well ahead of sleet and snow. Some of the most devastating damage has occurred in early winter when a sleet storm covers the grass with ice and is followed by snow.

RODENT CONTROL IN APPLE STORAGES

The storage should be baited as it is being filled. Strychnine-treated Steamed-crushed Oats are the recommended bait for mouse control in storages. They maintain their poisonous quality under the humid conditions inside. Teaspoonful quantities of this bait should be placed in stations such as cigar boxes, short lengths of pipe, or sections of rolled roofing paper. These stations should be placed under the pallets, as well as along the walls. Since mice may not travel more than a few feet during the entire winter, numerous bait stations should be used. A room 20' x 20' should have at least 15 bait stations. One application of this bait ordinarily provides adequate protection for the winter.

ORCHARD MOUSE BAITS

Orders and remittances for the following materials should be sent to: RODENT CONTROL FUND, University of Massachusetts, Old Conservation Building, Amherst, Massachusetts. Prices are F.O.B. Amherst, Massachusetts. Postal regulations do not permit mailing poisons. Shipments will, therefore, be made by REA Express or Truck Freight, with the shipping charges collect. MAKE CHECK PAYABLE TO: Treas., Rodent Control Fund.

Zinc Phosphide RODENTICIDE (1-Ounce Cans). . . . . $ .30 Can
(Packed 25 cans to the carton)

Zinc Phosphide-treated Steamed-crushed OATS. . . . . .35 lb.
(In 10, 25, and 50-pounds bags)

Strychnine-treated Steamed-crushed OATS . . . . .35 lb.
(In 10 and 25 pound bags)

These orchard mouse baits are available also from farmer-owned cooperatives.

---John W. Peterson
U.S. Fish and Wildlife Service

POMOLOGICAL PARAGRAPH

Foliage Color in Apple Orchards in September

Prior to the 1963 harvest we were blessed with excellent weather conditions for development of red color on apples. However, at harvest the foliage of apple trees in some orchards appeared light in color. This was particularly true in areas having insufficient rainfall, or on shallow rooted trees or those on light soil, and where growers have been attempting to lower nitrogen levels. In some instances, growers wished that additional nitrogen had been supplied. However, weather conditions are not predictable, and firm red apples are preferred to soft green fruit. Therefore, we believe the decision to reduce nitrogen was sound and that the maintenance of 1.8 to 1.9 per cent nitrogen level in bearing McIntosh trees should be the goal of orchardists desiring firm red apples.

---William J. Lord

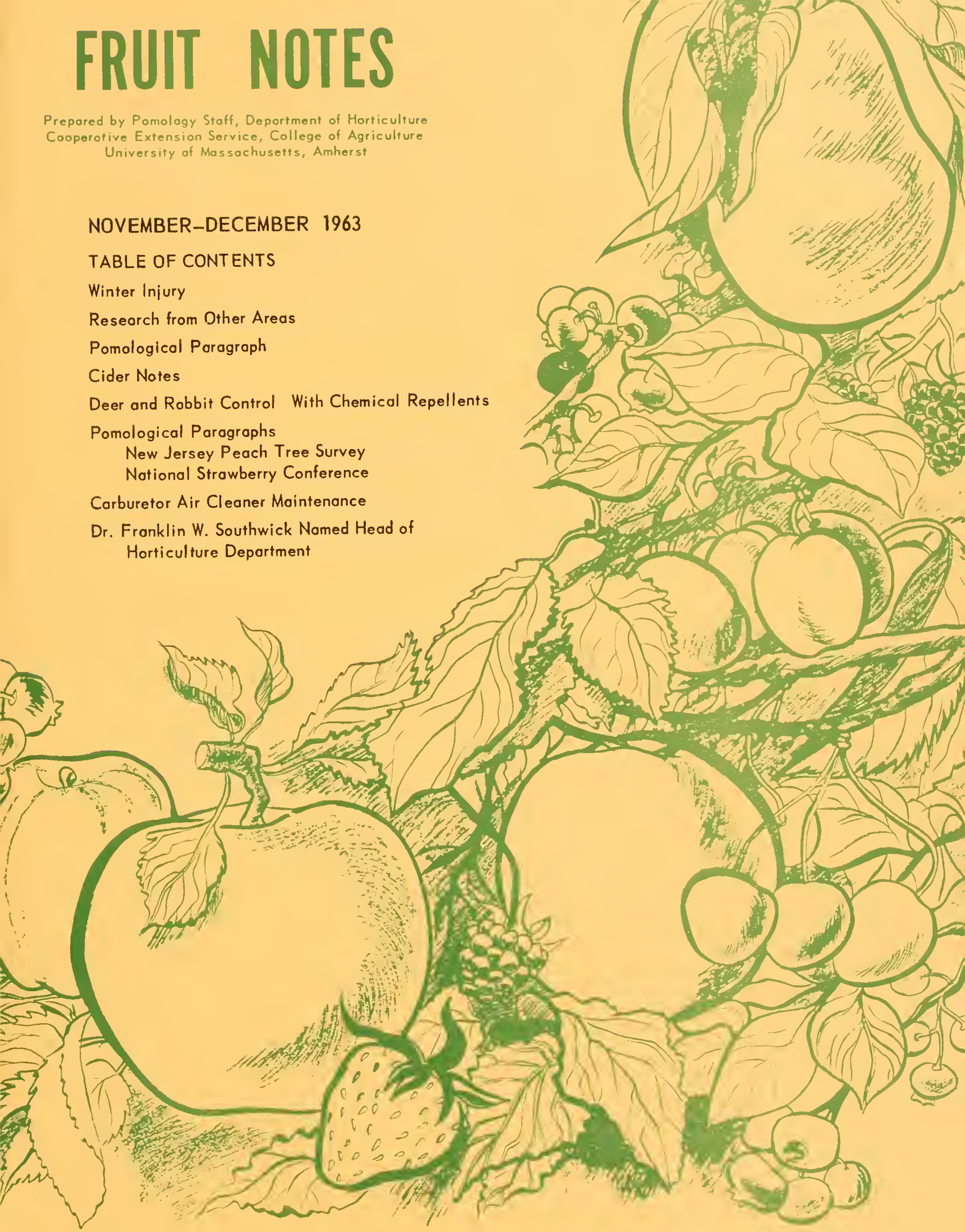
/ / / / / / / / / / / / / / / /

FRUIT NOTES

Prepared by Pomology Staff, Department of Horticulture
Cooperative Extension Service, College of Agriculture
University of Massachusetts, Amherst

NOVEMBER–DECEMBER 1963

TABLE OF CONTENTS



Issued by the Cooperative Extension Service, A. A. Spielman, Dean and Director, in furtherance of the Acts of May 8 and June 30, 1914; University of Massachusetts, United States Department of Agriculture and County Extension Services cooperating. Publication Approved by Alfred C. Holland, State Purchasing Agent, No. 44.

MAILING LIST REVISION

In accordance with penalty mailing regulations, the mailing list for Fruit Notes is being revised. Enclosed with this issue is a return card for you to indicate if you wish to remain on the mailing list. Return this card promptly so as not to miss the next issue of Fruit Notes to be mailed in January. Persons receiving this periodical by subscription will not receive a card, but will be sent the usual renewal notice at the time their subscription expires.

SAVE THESE DATES

The 70th Annual Meeting of the Massachusetts Fruit Growers' Association, Inc. in cooperation with the University of Massachusetts Extension Service will be held in the Gardner Armory, Gardner, Massachusetts on January 7 and 8, 1964.

All pesticide chemicals mentioned in this publication are registered and cleared for the suggested uses in accordance with federal laws and regulations. Chapter 727, Acts of 1960, Commonwealth of Massachusetts requires that all pesticides sold in Massachusetts be registered with the Massachusetts Department of Public Health. Trade names, where used for clearness, do not indicate endorsement nor imply that similar products are not satisfactory.

WARNING! MOST PESTICIDES ARE POISONOUS. READ AND FOLLOW ALL DIRECTIONS AND SAFETY PRECAUTIONS ON LABELS. HANDLE CAREFULLY AND STORE OUT OF REACH OF CHILDREN, PETS AND LIVESTOCK.

Winter Injury

The results of H. A. Rollins, Jr. and et al published in Ohio Agricultural Experiment Research Bulletin 901 show that for a short period after apple trees are heavily pruned, the cold resistance of the trees is reduced. They suggest that prior to January, growers should avoid pruning the more tender apple varieties if severe low temperatures are predicted within a few days.

The findings of H. A. Rollins, Jr. and et al substantiate the observations of growers who have noted winter injury to apple trees pruned just prior to a period of sub-zero temperatures.

---William J. Lord

/ / / / / / / / / / / / / / / / / / / /

RESEARCH FROM OTHER AREAS

The results of a fruit tree survey conducted in New York was discussed by B. A. Dominick in the November 1962 issue of the New York State Horticultural Newsletter. Surveys of this type are of value in determining the future trends of the fruit industry. Because the varieties grown in New York are similar to those in our Massachusetts orchards, the information taken from B. A. Dominick's article is of particular interest.

It can be noted below that in western New York, Monroe and Idared account for 7 and 6 per cent respectively of the total non-bearing trees. Idared has been recommended for trial in Massachusetts for the last several years. The Monroe variety was discussed in the January 1963 issue of Fruit Notes by Dr. W. D. Weeks in the article titled "Notes on New Apple Varieties". This variety was introduced primarily as a processing apple but has good dessert qualities. Dr. W. D. Weeks is of the opinion that where a dual-purpose variety is desired, Monroe appears worthy of trial.

Apple Varieties in Eastern N. Y.

"While recent plantings of young apple trees in both sections of the State have been at rates high enough to maintain bearing tree numbers, the percentages vary widely between different varieties in both areas. Included in the tables for Eastern and Western New York are each variety of apples amounting to at least one per cent or more of trees under eight years of age or those eight years old or older. In Eastern New York, McIntosh is the leading variety among bearing trees accounting for 42 per cent of the total (table 2). This variety accounts for only 27 per cent of the total non-bearing trees of all varieties. Only 16 per cent of the McIntosh trees are non-bearing, while the estimated percentage necessary to maintain the number of bearing McIntosh trees is estimated to be 18. Among the five leading varieties, Delicious promises to be more important in the area in the future with 39 per cent of all the non-bearing trees. Followed by McIntosh, the next most important variety in young plantings is Golden Delicious with 10 per cent of the total. Rome follows Golden Delicious with eight per cent. No other variety accounts for as much as four per cent of the total young trees.

Table 2. Relative importance of apple varieties and how they are being maintained, Eastern New York, January 1, 1962.

Variety	Bearing trees[a]	Non-bearing trees[b]	Proportion Non-bearing
	per cent of total		per cent
McIntosh	42	27	16
Delicious	15	39	42
Cortland	10	3	7
Rome	8	8	20
Golden Delicious	5	10	38
Northern Spy	3	*	3
R. I. Greening	3	*	3
Baldwin	2	*	*
Early McIntosh	1	3	38
Stayman Winesap	1	1	19
Milton	1	*	9
Macoun	1	1	22
Lodi	*	1	57
Spartan	*	1	94
Idared	*	1	98
Wellington	*	1	99
Jersey Red	0	1	100
Other	8	3	--
Total	100	100	23
Number of trees (000)	878	261	--

[a]Eight years and older.
[b]Under eight years.
*Less than one per cent.

Apple Varieties in Western N. Y.

"In Western New York, Rhode Island Greening leads the bearing trees with 19 per cent of the total, followed closely by McIntosh with 18 per cent (table 3). Rome, Baldwin and Cortland account for nine or ten per cent each of the total bearing trees. Delicious leads all the other varieties in recent plantings and amounted to 20 per cent of all trees less than 8 years old. Rome is second with 13 per cent and Rhode Island Greening and Golden Delicious are tied with 10 per cent each. Some newer varieties and older ones important in plantings in Western New York are Monroe with 7 and Idared with 6 per cent of all young trees".

Table 3. Relative importance of apple varieties and how they are being maintained, Western New York, 1962.

Variety	Bearing trees[a]	Non-bearing trees[b]	Proportion Non-bearing
	per cent of total		per cent
R. I. Greening	19	10	17
McIntosh	18	8	15
Rome	10	13	34
Baldwin	10	*	1
Cortland	9	3	12
Delicious	6	20	56
Northern Spy	5	2	13
Ben Davis	5	1	5
Wealthy	5	1	8
Twenty Ounce	3	9	52
Golden Delicious	2	10	63
Early McIntosh	1	2	52
Jonathan	1	*	25
N. W. Greening	1	*	*
Monroe	*	7	86
Idared	*	6	97
Webster	*	1	87
Wellington	*	1	96
Other	5	6	--
Total	100	100	28
Number of trees (000)	1,112	440	--

[a]Eight years and older.
[b]Under eight years.
*Less than one per cent.

---William J. Lord

/ / / / / / / / / / / / / / / / /

POMOLOGICAL PARAGRAPH

R. G. Hill, Jr., Ohio Agricultural Experiment Station reports in Research Bulletin 903 titled "The Effect of Sod as a Soil Management Practice Upon the Growth and Yield of the Peach" that peach trees may be expected to produce growth and yields comparable to those under cultivation if ample quantities of moisture and nutrients are available. Under the conditions of this study the nitrogen level of the peach trees grown in the bluegrass sod was maintained at approximately that of the trees grown under cultivation by doubling the rate of nitrogen applied.

It is of interest to note that Dr. W. D. Weeks of our pomology staff has suggested that peach trees in sod should receive about twice the normal rate of nitrogen.

Since the foliage analysis service is limited to sampling in problem blocks only, the grower must rely on experience and observations of annual terminal growth for evaluating nitrogen status of his trees. Non-bearing peach trees should produce 18 inches of terminal growth and bearing trees 12 to 15 inches. Without irrigation, it is difficult to obtain this amount of growth during a summer like 1962.

---William J. Lord

/ / / / / / / / / / / / / / / / /

CIDER NOTES

Sanitation

Food plants throughout the nation are continually visited by Federal Food and Drug inspectors, state public health personnel, city inspectors and others. Many of the plants have their own sanitarian supervising a clean-up crew. Why?

Many reasons can be given but the principal one is that clean, wholesome food processed in a clean, sanitary plant has more appeal to the consumer plus a longer storage life. Tests on frozen, canned and refrigerated foods have definitely shown that as the number of bacteria, yeasts and molds rises, there is a corresponding loss in flavor, color, and storage life.

Fresh cider reacts in the same way. Thorough cleaning with hot water, brushes, sanitizers and detergents of the press, tanks, grinder or grater, racks, press cloths, elevator, and other equipment plus the floors and walls will insure good sanitation. Equipment should be dismantled, hosed off, and then cleaned. House flies and fruit flies while reduced in numbers by a good sanitation program, still must be controlled with a spray program.

Combining refrigerated storage of the finished apple cider with a good sanitation and fly control program will pay off in a better keeping product and satisfied customers.

Call It "Ap-peel" Cider

At a recent meeting of ciderfanciers, the product produced from apples containing one orange peel per bushel of apples had "decidedly" greater appeal than any other straight or combination-cider product. (From "Food Processing")

Next Year's Cider

Ever notice how flat and insipid early cider is? Why not plan now to produce and freeze cider from Baldwins, Greenings, crabapples, Jonathans or like varieties to give a lift to early cider. By producing it now, holding it frozen until next Fall, you can give a lift to early cider flavor, as well as boosting sales.

---Kirby M. Hayes
Food Science and
Technology

/ / / / / / / / / / / / / / / / /

DEER AND RABBIT CONTROL WITH CHEMICAL REPELLENTS

DEER CONTROL:

With Winter approaching, the problem of DEER browsing on fruit trees may become acute in many orchards. There are various means of controlling deer, depending upon the situation and the economics involved. If the financial expenditure can be justified, deer-proof fences can be used. Fencing affords year-round and long-term protection. A second means of minimizing damage is by using chemical repellents. Basically, there are two types of repellents: area repellents; and taste repellents.

To date, area repellents have proved unsatisfactory. Taste repellents are more practical and effective. The function of a taste repellent is to make the treated material less desirable and palatable. Taste repellents are divided into two groups: Winter or dormant season; and Summer or growing season.

It is appropriate that we discuss the dormant season repellents at this time. The duration of effectiveness of any repellent is primarily dependent upon weather conditions. Usually under normal conditions a repellent, with a sticker, will last for 2 or 3 months; one without an adhesive material tends to wash off or become diluted more readily.

The NEW IMPROVED, Z.I.P. is a ready-to-use concentrate which contains a sticker. One gallon of NEW IMPROVED Z.I.P. should be mixed with one gallon of water and stirred thoroughly.

ARASAN 75 is another effective repellent. For brush application, mix 1 pound of Arasan 75 with 1 quart of Rhoplex AC-33 or Latex 512R and 2-1/2 quarts of water. For spray application, use Arasan 75 with 0.5 millimeter orifices or larger and 50-mesh strainer. Stir this mixture frequently.

When ARASAN 42-S is used, mix 1 quart of Rhoplex AC-33 or Latex 512R with 2 quarts of water and add 1 quart of Arasan 42-S. Mix these ingredients thoroughly. When using Arasan 42-S, mix only enough material for immediate use as the solids in the finished preparation settle after standing several days and are difficult to mix into suspension again. This mixture may be applied as a spray or by brush.

Arasan contains Thiram. Other commercial products containing Thiram as a repellent agent are available. However, if any of these materials are used, close adherence to the directions on the label should be followed.

When applying a repellent, treat all the terminal tips to at least 6 feet above the expected snow line. If difficulty is encountered when trying to get the material to adhere to the smooth bark of young stock, add 1/4 ounce Methocal (1500 c.p.s. viscosity) per gallon and 3/4 ounce of Hexadecanol-ethanol per gallon. The weather-resistant qualities of the mixture are also increased by the addition of these materials.

Applications of repellents should be made before snowfall; and frequent checks should be made throughout the area to determine how well the material is standing up to the elements. If an area has had a past history of damage, plans should be made to treat this location.

RABBIT CONTROL:

Although COTTONTAIL RABBITS are an important game animal, they can cause serious damage to fruit trees, cultivated blueberry plants and nursery stock. Cottontail populations are relatively local; removing or excluding these animals can be accomplished by live trapping, shooting, fencing, and the use of repellents.

For Winter protection, use repellents such as IMPROVED Z.I.P., ARASAN, and RINGWOOD. The formulas and means of application for IMPROVED Z.I.P. and ARASAN 75 are the same as for controlling deer. However, when using ARASAN 42-S for controlling rabbits, use 3 quarts of water. RINGWOOD REPELLENT is a commercial product that is sold in ready-to-use form. RINGWOOD is recommended for use only during the dormant season. This repellent can be applied by spray gun or brush. Use benzol, or a similar solvent, to clean spray equipment before using for other purposes. This material is highly inflammable and should not be used near an open flame.

All bark and twigs, to a height that rabbits might reach during a heavy snowfall, must be coated with the repellent. Trees should be checked frequently to determine when the area should be re-treated. If damage begins to reoccur, the area should be treated immediately. Effective duration for rabbit repellents is about the same as for deer. As a general rule-of-thumb, for all rabbit repellents 1 gallon will treat 100 two-four foot trees by brushing; or, 300-600 trees by spraying. Applications should be made early in November.

---Rene M. Bollengier, Jr.
U.S. Fish and Wildlife
Service

/ / / / / / / / / / / / / / / /

POMOLOGICAL PARAGRAPHS

New Jersey Peach Tree Survey

The most popular peach varieties in New Jersey as reported in the September, 1963 issue of Horticultural News are: 1. M A. Blake, 2. Rio-Oso-Gem, 3. Red Haven, 4. Sunhigh and 5. Triogen. These 5 varieties accounted for 49% of the peach trees in the state. A sharp drop in plantings of Elberta, J. H. Hale, Jerseyland, Summercrest, Sunrise and Triogem has occurred since 1957.

In the last 6 years the number of peach trees in commercial orchards has increased 8 per cent. On the other hand, the number of commercial peach growers in New Jersey has declined from 499 in 1957 to 345 in 1963. Forty-four per cent of the 1,079,192 peach trees were young trees, 5 years old or less.

In summary, it appears that the peach industry in New Jersey is expanding but is in the hands of fewer growers.

---William J. Lord

National Strawberry Conference

On January 24-25, 1963 a National Strawberry Conference was held at Rutgers University, New Brunswick, New Jersey. A very fine program was arranged by the members of the Horticultural staff. Speakers from all over the United States and several foreign countries gave short, pointed talks on a wide variety of subjects. An excellent report of this conference "The Strawberry, Varieties, Culture, Marketing, Pest Control" has been compiled by Carter R. Smith and N. F. Childers. Copies of this report can be obtained by sending a check or money order for $2.50 to N. F. Childers, Department of Horticulture, Rutgers University, Nichols Avenue, New Brunswick, New Jersey.

This report contains brief summaries of the latest information on strawberry insect, disease and nematode control, the booming Mexican strawberry industry, varieties, planting problems, irrigation, nutrition, winter protection, weed control, labor saving machinery, and economics and marketing.

---John S. Bailey

/ / / / / / / / / / / / / / / / / /

CARBURETOR AIR CLEANER MAINTENANCE

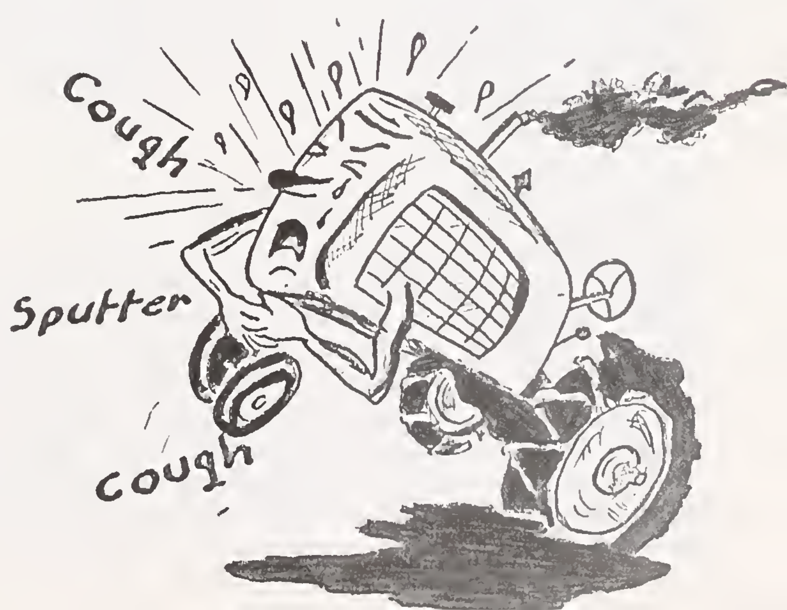
An air cleaner is standard equipment on every tractor now manufactured. Its purpose is to prevent dust, grit, and other foreign matter from entering the engine with the air.

Many tractor troubles arise from the lack of air cleaner service yet it is difficult to get farmers to recognize the importance of this maintenance chore. Under severe dust conditions an engine would be worn out and completely ruined in less than a week's operation if it were not equipped with an efficient air cleaner. Proper servicing is essential if the air cleaner is to maintain its original efficiency.

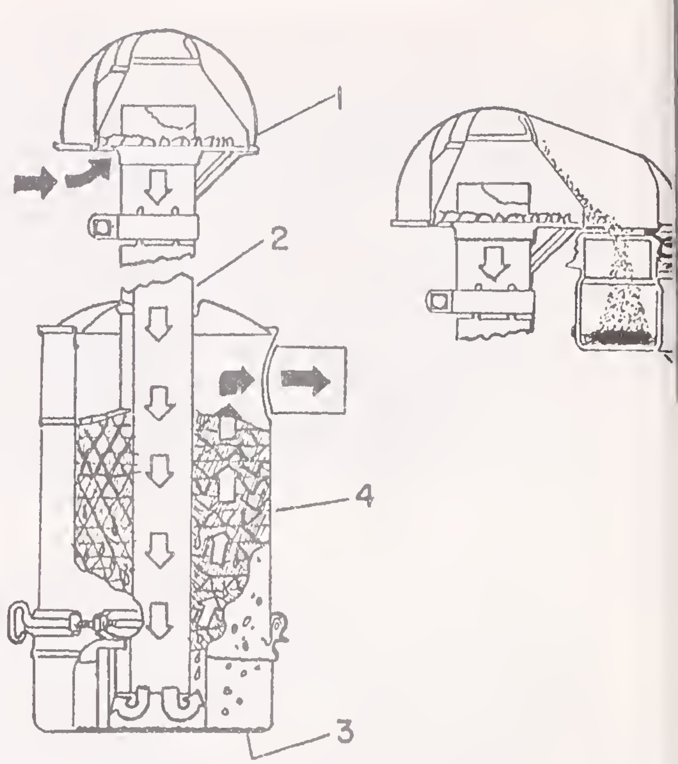
Lack of Service Reduces Power and Causes Wear

A tractor engine requires about 225,000 cubic feet of air per day -- enough to fill four farm silos and this amount of air can contain as much as ½ pound of dust. Without an air cleaner all this dust would be drawn into the engine and cause terrific wear.

Without proper service an air cleaner can become so plugged with dirt that air flow to the engine is restricted thus reducing its maximum horsepower output. Air cleaner neglect is also a quick ticket to the repair shop because poor cleaner maintenance accelerates wear of rings, pistons, sleeves, and bearings and promotes the formation of oil sludge and other engine troubles.



A Schedule for Proper Servicing



Most air cleaners on present day tractors are of the oil bath type. These cleaners collect dirt in four places that require periodic cleaning.

1. In the screened cap or precleaner.
2. On the sides of the center pipe.
3. In the bottom of the oil cup.
4. In the filter element.

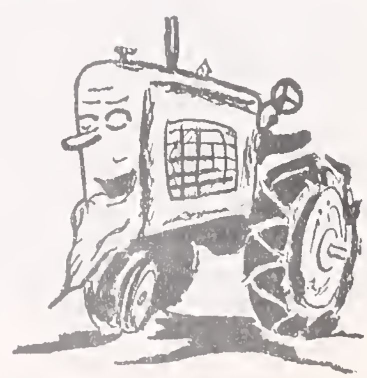
Most cleaners will continue to perform efficiently if operators will follow this schedule:

Daily or Every 10 Hours - Remove and inspect the oil cup. If more than ½ inch of dirt has collected, or if the oil has thickened, discard the old oil, scrape dirt out of the cup, wash the cup in kerosene, refill to the oil level bead with fresh oil, and replace the cup. It is important that the proper oil level be maintained in the cup whether it is or is not cleaned. Check the lower screen of the filter element and remove any chaff or dirt while the cup is off. The screened cap or prefilter should also be checked daily and cleaned if necessary.

Every 60 Hours - In addition to the regular 10 hour maintenance, remove the air cleaner from the tractor, disassemble it and wash it thoroughly in kerosene. Clean the oil cup, precleaner, and valve cover breather by washing in kerosene. Inspect air cleaner hoses and clamps to make sure there are no air leaks.

What Oil to Use - The oil for the air cleaner should be the same viscosity and type as the oil used in the crankcase. Too heavy an oil will choke the tractor causing it to lose power and waste fuel. Oil that is too light will be pulled into the engine where it will form harmful deposits. Also, the resulting low oil level in the cleaner will permit dirt to enter the engine. Used oil is not satisfactory for use in air cleaners since it already contains carbon, unburned fuel, and dirt.

Special Warning to Diesel Owners



Because diesel tractors require more air than gasoline models, the air cleaner will require more frequent service. Using too light an oil in the cleaner cup or overfilling the cup can cause a runaway engine. As excess oil is drawn into the air cleaner it provides an uncontrolled fuel source and though the governor will shut off the regular fuel supply, the engine will continue to run on the oil supply from the air cleaner gaining uncontrollable speed and possibly causing extension damage. The engine can be stopped by blocking

the air cleaner inlet. It is best to prevent such emergencies by using the proper amount of oil of the correct viscosity.

Remember -

Proper air cleaner care insures longer engine life!

---M. Boyd
Agr'l. Eng. Dept.

/ / / / / / / / / / / / / / / / /

DR. FRANKLIN W. SOUTHWICK NAMED HEAD OF HORTICULTURE DEPARTMENT

Dr. Franklin W. Southwick, research professor of pomology at the University of Massachusetts since 1948, has been named head of the department of horticulture in the College of Agriculture, President John W. Lederle announces.

Dr. Southwick, an alumnus, pomology '39, succeeds Professor Grant B. Snyder who retired June 30 of this year.

From 1945-48 Dr. Southwick was an assistant professor in the department of pomology at Cornell engaged in Extension and research work. Prior to this time he did research and teaching in the horticulture department at the University of Connecticut.

Dr. Southwick obtained his M. S. degree in horticulture from Ohio State University in 1940, and his Ph.D. from Cornell University in 1943, majoring in pomology with a minor in plant physiology and plant anatomy.

---Radie H. Bunn
Communications Specialist

/ / / / / / / / / / / / / / / /

FRUIT NOTES

Prepared by Pomology Staff, Department of Horticulture
Cooperative Extension Service, College of Agriculture
University of Massachusetts, Amherst

JANUARY 10, 1964

TABLE OF CONTENTS

Issued by the Cooperative Extension Service, A. A. Spielman Dean and Director, in furtherance of the Acts of May 8 and June 30, 1914; University of Massachusetts, United States Department of Agriculture and County Extension Services cooperating.
Publication Approved by Alfred C. Holland, State Purchasing Agent, No. 44.

MAILING LIST REVISION

If you did not return the mailing list revision card for Fruit Notes enclosed with the October issue, you will find another card enclosed with this issue. This card must be returned if you wish to receive future issues of Fruit Notes.

VARIETIES OF PEARS AND QUINCES FOR MASSACHUSETTS

Pear Varieties

Variety	Recommended For	Harvesting Season
Clapp Favorite	C & H	Mid-August
Early Seckel	T	Late August
Bartlett	C & H	Early September
Gorham	C & H	Mid-September
Devoe	T	Mid-September
Seckel	C & H	Mid-September
Flemish	C	Mid-September
Ewart	T	Mid-September
Bosc	C & H	Late September
Anjou	C & H	Late September
Dumont	T	Early October

T - Trial H - Home Garden C - Commercial
Varieties so marked are not equally adapted to all sections of the State.

Variety Notes

Clapp Favorite Fruit greenish yellow with a blushed cheek, good quality, large attractive, tends to blacken at core when over-ripe, does not keep well. Tree hardy, productive, susceptible to fireblight.

Early Seckel A seedling of Seckel. Resembles its parent in coloring but is larger and has a more distinct neck. Fruit is attractive, very good in flavor and keeps well for an early variety. Tree is medium in size, vigorous and productive.

Bartlett Leading commercial pear variety. Fruit yellow, good quality, large size, firm, ships well. Tree medium in size, productive, adapted to wide variety of soils, is susceptible to fireblight.

Gorham A seedling of Bartlett which it resembles in size and color. Flesh is white, tender, melting and juicy. Holds in storage longer than Bartlett and may be a desirable variety to extend the Bartlett season. Said to require a higher level of nutrition than Bartlett to maintain production.

Devoe A large, attractive pear of oblong pyriform shape, clear yellow with a red blush, good quality. Tree is vigorous and very productive. Tendency to ripen unevenly may necessitate spot picking.

Seckel Fruit bronze color, small, excellent quality, a popular variety for pickling. Tree large, upright-spreading, productive in alternate years, immune to fireblight.

Flemish Fruit large, attractive, excellent, highly susceptible to pear scab which can be controlled effectively with modern fungicides. Tree large, vigorous, very productive in alternate years, highly resistant to winter cold.

Ewart — Fruit large, yellowish-green with some russeting, good quality, keeps well in storage, less attractive than Bartlett. Tree is moderately productive and is more blight resistant than Bartlett.

Bosc — Fruit russet, large with long neck, excellent quality when ripened properly, excellent keeper and shipper. Tree medium size, zig-zag growth, productive, tendency to biennial bearing.

Anjou — Fruit greenish, large, good quality, good keeper and shipper. Desirable as a late market variety. Tree large, may lack in vigor and production.

Dumont — A late ripening pear of medium to large size and obtuse pyriform shape. The flesh is firm, juicy and the quality very good. The tree is vigorous and productive.

Quince Varieties

Quince production in Massachusetts is primarily a home garden enterprise although there are a few commercial plantings. This fruit is used entirely for jellies and preserves. Quince trees are notoriously susceptible to fireblight and quince rust. These diseases are not so serious in Massachusetts as to preclude the growing of this fruit provided adequate control measures are employed. Two varieties only are propagated by Eastern nurserymen, namely Orange and Champion. Characteristics of these varieties are as follows:

Orange — Fruit roundish, greenish yellow, medium size, flesh pale yellow, tender, mild. Ripens in October a few days ahead of Champion. This variety is by far the more popular.

Champion — Fruit large, pear shaped, yellowish, with considerable pubescence, flesh pale yellow, firm slightly astringent, aromatic, mild subacid. Somewhat inferior in quality to Orange.

---James F. Anderson

/ /

POMOLOGICAL PARAGRAPH

Special Circular Revised - Special Circular No. 247 titled "Pollination of Fruit Plants" has been recently revised and is available through your county extension service or by writing to the Mailing Room, University of Massachusetts. This circular discusses the pollination requirements of our common fruit. Also, some of the apple varieties grown in New England which are generally suitable cross-pollinizers for each other are listed.

---William J. Lord

/ /

APPLE VARIETY OBSERVATIONS FROM BRISTOL COUNTY

Idared	Excellent size and color. Bears young, annual bearer and does not overset. Good keeping quality, excellent baker and good for pie. Fair as fresh fruit. Tree on small side. Picks late.
Monroe	Tree like Rome but fruit superior in quality. Picks late. Would plant in preference to Rome or Baldwin.
Melrose	Tends to be biennial. Fruit less attractive than Idared or Monroe.
Spencer	Good size, vigorous tree, picks late.
Spartan	Excellent color but small. Harvest date follows close to McIntosh.
Bridgham Delicious	Lacks Delicious fruit shape. Tree also coarser (diameter of the one year wood much larger than on other Delicious sports).
N.Y. 44416-6	Macoun X Spy. Late, large attractive fruit of excellent quality. Fruit russets in Bristol County. Slow maturing tree.
Niagara	Two weeks earlier than McIntosh. Fruit large and attractive but quality only fair. Would plant in preference to Milton.
Puritan	Two pickings about mid-August. Fruit large, often irregular, attractive. Too acid for fresh fruit. Soft if picked too ripe.
Mass. A 11*	Transparent X Cortland. Trial samples distributed same time as Puritan. Should not be discarded. Better than Wealthy, Gravenstein or Duchess as a cooker. Bears young, alternately light and heavy. Fruit large, smooth, attractive if allowed to mature.

*Editor's Note - Mass. A 11 was one of several seedlings developed at University of Massachusetts. It was discarded in preference to Puritan.

---Harold O. Woodward
County Extension Agent
Bristol County

/ / / / / / / / / / / / / / / / / /

THE MEXICAN STRAWBERRY INDUSTRY

It will probably surprise you, as it did me, to learn that Mexico not only has a strawberry industry but exports a considerable amount of berries to the United States.

Mexico has two strawberry growing areas. One is near Irapuato about 200 miles northwest of Mexico City, at an elevation of about 5,700 feet. The other is a new area in the vicinity of Zamora a few miles east of Guadalajara at an elevation of about 6,000 feet. The two areas are about 200 miles apart.

The principal varieties are Klondike and Florida 90. Klondike is preferred for freezing and Florida 90 for fresh fruit. Most of the berries are frozen. Only a small portion is shipped fresh.

Fruit is harvested all twelve months of the year. During November, December and January the crop is light. The heaviest picking is in March, April, May and June. By far the largest part of the berries exported to the United States is frozen.

Imports of Strawberries from Mexico in 1,000 Pounds

	1959	1960	1961	1962
Frozen	14,064	25,017	29,817	32,421
Fresh	51	562	579	751

If the Mexicans solve their quality control problems, many more fresh berries will be exported to the United States.

---John S. Bailey

/ / / / / / / / / / / / / / / /

NEW APPLE VARIETIES FOR FUTURE PRODUCTION

The choice we make in planting new varieties now will determine what the production of new varieties will be in 1973. How successful we are in choosing a profitable variety cannot be fully determined until we have enough volume of fruit to determine consumer acceptance of the variety. Planting any new variety is a calculated risk until consumer acceptance has been determined.

The method of sale may be a factor in the selection of a new variety. A variety which has desirable qualities for a processing apple may not have sufficient quality and appeal for sale on a retail stand or in the fresh fruit market. However, some varieties possess suitable qualities for both processing and fresh fruit sales. These varieties are called dual-purpose types.

New varieties which have been tested for a sufficient number of seasons to indicate their potential value will be discussed first.

Puritan is an early attractive red apple which ripens just ahead of Early McIntosh. Puritan appears to have made a favorable impression in the trade as an early apple. It may possibly replace Early McIntosh. The attractive McIntosh-like appearance and good size are Puritan's major strong points. Puritan tends to be biennial and its fruit quality is only average as it has a rather tart flavor.

Wellington is a large fairly attractive apple which ripens with Melba. It has average quality, but is primarily a processing apple. Wellington has never set a full crop in our test planting, although other varieties in the same block have set full crops and some have overset. Wellington also has very tender foliage which is very susceptible to spray injury. It appears doubtful that Wellington has much potential as a variety for the future in this area.

Spartan is an attractive well colored dark red apple which ripens about a week after McIntosh. It has excellent quality and good storage qualities. Spartan's most serious weakness is lack of fruit size. Spartan is potentially a good retail stand variety.

Idared is a very attractive bright red winter apple which ripens about one month after McIntosh. It has good quality and a long storage life. The tree is productive and annual. Idared is a dual purpose apple and offers much promise as a future variety.

Melrose is another dual purpose apple which ripens about three weeks after McIntosh. It has excellent quality and is an attractive dark red when well grown. Under some growing conditions Melrose is subject to russeting.

Spencer is a late maturing high quality apple. The fruit is attractive bright red. While Spencer is primarily a dessert apple, it is also suitable for pie. The fruit may be subject to storage disorders if held too long in storage. Spencer is a promising apple for roadside stand trade.

Monroe is a late maturing processing apple which ripens about one week after Delicious. It is bright red and fairly attractive when well colored. It has fair to good dessert qualities. Monroe foliage is susceptible to powdery mildew. Monroe appears to fit the need where a processing apple is desired.

A second list of varieties which have not been tested, but are worth watching as future varieties would include Tydeman's Red and Niagara which ripen before McIntosh. New varieties ripening after McIntosh would include Wayne, Spigold, Mutsu, and Sungold, and the spur type Delicious and Golden Delicious sports.

---W. D. Weeks

/ / / / / / / / / / / / / / / / /

CHECKING APPLE VARIETIES

Apple varieties make an interesting subject for discussion by both the consumer and the grower. Growers with farm sales rooms find many customers with an interest in old time varieties. However, except for sales at roadside stands or for cider, there is little grower interest in growing old varieties. Interest in new varieties is great, however.

Apple varieties carry the key to production economics and consistent crops. Although not generally discussed, the variety is recognized by marketing

specialists to be an integral part of a successful selling program. Moreover, it should be kept in mind that variety selection determines to a great degree the success or failure of an orchard operation for years to come. There is no better example of this than McIntosh, which has set a long time pattern for the New England apple industry.

Promising new varieties should be given thorough testing by growers! Top-working trees is a time saving way to get a quick look at the fruit. Information on tree growth, hardiness and production is best obtained over a longer period of time by starting with trees budded to the desired varieties.

Don Priest of Groton is supplying us with some valuable information on the performance of several new varieties. He has top-worked trees to Spartan, Ruby, Idared, Spencer and Mutsu. Of the Geneva, New York Experiment Station crosses, he is testing Spigold and two promising selections still under number. These are N.Y. 44416-6 (Macoun x Red Spy) and N.Y. 43021-2 (Red Spy x Golden Delicious). The fruit of the latter is brilliant blush, pinkish-scarlet over a light yellow ground color with high quality. Mr. Priest was slightly disappointed in fruit size of N.Y. 43021-2 during the past dry summer. The delicate, high eating quality of even the smallest sizes was remarkable, however. Other years the size has been good.

Spartan is a favorite with Don Priest and with other growers testing the variety. Don has fruited Spartan for several years and it has proven to be an annual producer of high quality fruit that handles and keeps well in storage. It is a consistently attractive dark, red apple. The principal weakness of Spartan is small fruit size. Extra attention is needed to improve its size.

Picking maturity is a factor in determining the storage life of Spartan. Downing Brothers of Westford checked this point by comparing fruit harvested on September 20 with fruit picked on October 2, 1963. These dates were considered to be the harvesting extremes of this variety and the apples tend to substantiate this claim. A recent examination of these fruit reveals that those harvested on September 20 were in firm condition with little apparent ripening. An earlier harvest date might have adversely affected the flavor. The Spartan apples harvested on October 2 had attained excellent eating quality but appeared too mature for long storage.

Another promising development is a sport found at the Pinecrest Orchards of Stephen Sabin, Groton. This resembles regular McIntosh in appearance except for its unusually bright red color. The sport seems to be firmer than other strains of McIntosh.

These are merely a few comments on some of the varieties which we believe show promise. Special Circular 212-A will give you a brief but useful description of apple varieties currently being recommended for Massachusetts.

---Max Fultz
Regional Agricultural Specialist

/ / / / / / / / / / / / / / / / / /

VARIETIES OF BLUEBERRIES FOR MASSACHUSETTS

Variety*	Recommended For	Harvesting Season
Earliblue	C & H	Early
Collins	T	Early
Blueray	C & H	Early
Bluecrop	C & H	Midseason
Berkeley	C & H	Midseason
Herbert	T & H	Late
Jersey	C & H	Late
Coville	C & H	Late

*In approximate order of ripening.
T - Trial   H - Home Garden   C - Commercial

Variety Notes

Earliblue Ripens early, fruit light blue, very firm, good flavor, cluster medium size, medium loose. Bush upright, vigorous, well shaped, easy to prune and propagate, fairly productive. Especially attractive to birds.

Collins Ripens early, midway between Earliblue and Bluecrop. The bush is erect, vigorous, and moderately productive. May winter kill in cold winters or cold locations. The fruit is borne in medium-sized, rather tight, attractive clusters. The berries are as large as Earliblue, firm, light blue in color and highly flavored. Fruit does not drop nor crack. Recommended for trial as a second early.

Blueray Ripens early, just after Earliblue, in Rancocas-Stanley season; fruit clusters small, tight, attractive; berries very large, firm, light blue, aromatic, very fine flavored if fully ripe; bushes erect, somewhat spreading, vigorous and productive. Has considerable cold resistance.

Bluecrop Ripens early mid-season, fruit very light blue, very firm, good flavor, small scar, clusters large, medium loose. Bush upright, vigorous and productive, easy to propagate. Resistant to spring frost and winter cold.

Berkeley Ripens mid-season, fruit very large, light blue, firm, mild flavor, scar large and dry; bush upright, vigorous, productive, easy to propagate and prune.

Herbert Ripens late, fruit large, fair blue, good scar, flavor good, skin tender; bush spreading, vigorous, productive and easy to propagate. Superior for local market and home use.

Jersey Ripens late, fruit medium to large, fair blue, attractive, firm, good flavor, but tart if not fully ripe, good scar, open cluster; bush upright, vigorous, productive, hardy.

Coville Ripens very late, fruit large, firm, good scar, highly aromatic flavor, tart when not fully ripe, good blue, attractive; bush upright, spreading, vigorous and very productive.

---John S. Bailey

/ / / / / / / / / / / / / / / / / / / /

PLUM VARIETY OBSERVATIONS

Burmosa A large attractive plum ripening in late July. The fruit is a cherry red, of high quality and a freestone. The tree is small in size and of moderate vigor. Production was light in 1963. Japanese type plum.

Brilliant This red plum is of good size and quality. Brilliant ripens with Formosa in early August and is inferior to that variety in size, flavor and appearance. Brilliant is more productive than Formosa in our planting. Japanese type plum.

Great Yellow - A Japanese type plum ripening in early August. The fruit is of good size, good quality and a freestone. The tree is productive and the fruit hangs well on the tree. Great Yellow ripens with Shiro and is superior to Shiro in size and quality. Shiro may have a slight advantage in color.

Howard Miracle - A large, attractive, high quality Japanese plum. The fruit is a golden yellow with a light red blush. Howard Miracle was picked on August 30th in 1963. The crop was very light in 1963 but it is too early to make an evaluation as to its productiveness.

Red Heart Another Japanese type plum ripening in mid-August. Red Heart has proven to be a very good producer of medium size plums. This variety has failed to develop satisfactory fruit quality under our conditions. Red Heart is said to be a very good pollinizer for other Japanese varieties.

Golden Transparent Gage - A high quality plum ripening in the third week of September. The fruit tends to be small and is golden yellow with numerous small red flecks. The tree is fair in production and dwarfish in habit. European type plum.

Pacific An attractive prune type plum of very high quality. The fruit is quite firm and keeping quality appears to be excellent. The fruit ripens in mid-September; ripening has been uneven in the past two seasons. Pacific has been a good producer in Amherst. European type plum.

New York 981 - A large reddish purple plum of very high quality. This attractive plum ripens in early September and appears to be promising. The selection should be productive. European type plum.

New York 826 - A late ripening plum of good size and quality. This selection ripened in early October and was quite productive. It is a prune type of reddish black color. European type plum.

---James F. Anderson

/ / / / / / / / / / / / / / / / / / / /

FRUIT NOTES

Prepared by Pomology Staff, Department of Horticulture
Cooperative Extension Service, College of Agriculture
University of Massachusetts, Amherst

FEBRUARY 10, 1964

TABLE OF CONTENTS

Issued by the Cooperative Extension Service, A. A. Spielman, Dean and Director, in furtherance of the Acts of May 8 and June 30, 1914; University of Massachusetts, United States Department of Agriculture and County Extension Services cooperating.
Publication Approved by Alfred C. Holland, State Purchasing Agent, No. 44.

COUNTY EXTENSION AGENTS IN SUPPORT OF THE FRUIT PROGRAM

BARNSTABLE	Oscar S. Johnson, County Extension Agent in Agriculture, Cape Cod Extension Service, Barnstable (Tel. FOrest 2-3255).
BERKSHIRE, FRANKLIN, HAMPDEN and HAMPSHIRE	G. Everett Wilder, Pioneer Valley Extension Agent in Agriculture, Hampden County Improvement League, 1499 Memorial Avenue, West Springfield (Tel. Springfield REpublic 6-7204)
BRISTOL	Harold O. Woodward, County Extension Agent in Agriculture, Bristol County Agricultural School, Center Street, Segreganset (Tel. Dighton NOrmandy 9-3611 or 9-2361).
DUKES	Ezra I. Shaw, County Extension Agent in Agriculture, Dukes County Extension Service, Vineyard Haven (Tel. Vineyard Haven 694).
ESSEX, MIDDLESEX and WORCESTER	Max G. Fultz, Regional Agricultural Specialist, Middlesex County Extension Service, 19 Everett Street, Concord (Tel. Concord EMerson 9-4845).
NORFOLK	Howard Wilson, County Extension Agent in Agriculture, Norfolk County Agricultural School, 460 Main Street, Walpole (Tel. Walpole MOntrose 8-0268 or 8-0269).
PLYMOUTH	Dominic A. Marini, County Extension Agent in Agriculture, Plymouth County Extension Service, Court House, Brockton (Tel. Brockton JUniper 6-4993).

All pesticide chemicals mentioned in this publication are registered and cleared for the suggested uses in accordance with federal laws and regulations. Chapter 727, Acts of 1960, Commonwealth of Massachusetts requires that all pesticides sold in Massachusetts be registered with the Massachusetts Department of Public Health. Trade names, where used for clearness, do not indicate endorsement nor imply that similar products are not satisfactory.

WARNING! MOST PESTICIDES ARE POISONOUS. READ AND FOLLOW ALL DIRECTIONS AND SAFETY PRECAUTIONS ON LABELS. HANDLE CAREFULLY AND STORE OUT OF REACH OF CHILDREN, PETS AND LIVESTOCK.

RESEARCH FROM OTHER AREAS

(Items included under this heading are for your information and may not apply to Massachusetts conditions in all instances.)

MALLING MERTON ROOTSTOCKS

In the March-May 1963 issue of Farm Research, Karl Brase discussed his observations of McIntosh, Red Delicious and Monroe on 4 Malling Merton Rootstocks. The following is information taken from the article.

M.M. 106

On heavy soil at Geneva, New York, McIntosh, Monroe and Red Delicious on M.M. 106 rootstocks have resulted in trees of a size one-half that of the same variety on seedling roots. The size controlling effect is more pronounced on Monroe than on either the Red Delicious or McIntosh varieties. Growth performance under the test conditions indicate that the important apple varieties grown in New York on M.M. 106 might best be planted 15 feet apart in the row and 30 between rows.

The roots of M.M. 106 provides good anchorage since they arise at nearly a right angle from the trunk and are equally well distributed on two sides. "Furthermore, sucker growth from the root system of the tree, often occurring when E.M. VII makes up the root system, is absent with trees on M.M. 106. Although a longer test period is needed to critically evaluate this apple rootstock, results obtained thus far indicate advantages over the presently much used E.M. VII rootstock."

M.M. 111

The growth of Monroe, McIntosh and Red Delicious on M.M. 111 indicates that the trees will be of similar size as those on E.M. II. Depending upon the variety, the trees will be 1/2 to 3/4 the size of the same variety on seedling roots.

The larger anchorage roots are more numerous than on M.M. 106. "Observations made during the past very dry summer indicate that trees on M.M. 111 in comparison with other E.M. and M.M. stocks were not affected by prolonged drought periods. Similar experiences as to the drought-resistance of M.M. 111 are reported from test areas in England."

Brase states for a tree of medium vigor such as Monroe, 15 feet by 30 feet planting distance should be ample. On stronger growing varieties the planting distance in the row might be increased to 20 feet.

M.M. 104

Brase reports that trees grown on M.M. 104 will be no smaller than 3/4 the size of the same variety on a seedling rootstock. Also, the trees do not reach full bearing as rapidly as those on M.M. 106 and M.M. 111. "Our test plantings indicate that the three varieties tested will not bear much earlier than those on standard seedling rootstocks, but that after full bearing age is reached, fruit production will be heavier than that of trees on seedling rootstocks."

The anchorage roots of M.M. 104 are not well distributed and the trees have a somewhat one sided root system. Brase points out the necessity of giving attention to proper placement of roots when planting and that the strongest root should be directed towards the prevailing wind.

The performance of the trees in the test area indicates that trees on M.M. 104 are best adapted to lighter well drained soils. On these types of soil, 20 feet by 30 feet planting distance appears to be a minimum.

M.M. 109

This rootstock has no size controlling effect. It is similar to E.M. II in that it has one-sided anchorage root development. However, M.M. 109 appears to be better adapted to heavy slowly drained soils than 104.

In conclusion, Brase states: "It must be kept in mind that these four clonal rootstocks of the M.M. series are new, but deserve trying out. For the fruit tree nurseryman, they have definite advantages over the older E.M. rootstocks, and orchard trials thus far are encouraging wider use of the four M.M. stocks in commercial orchard operations."

---William J. Lord

/ / / / / / / / / / / / / / / /

POMOLOGICAL PARAGRAPH

"Pick-your-own" Method of Sale

It was of interest to note on the program of the Indiana Horticultural Society Orchard Tour that an orchardist to be visited in Kenosha, Wisconsin sells the crop from 13 acres of cherries and 35 acres of strawberries under the "pick-your-own" system of marketing. This grower started with 3 acres of strawberries in 1950 and has expanded to 35 acres in 1963.

It is the editor's opinion that Massachusetts fruit growers, particularly those who raise small fruit, have not fully exploited the possibilities of the "pick-your-own" method of sale.

---William J. Lord

/ / / / / / / / / / / / / / / /

STUB PRUNING

Stub pruning of young apple trees is being advocated in some states. This means that undesirable limbs on the young trees are left instead of being removed. If the limbs are competing with the selected scaffold limbs, they are stubbed back to 6-12 inches in length. The theory behind stub pruning is that by leaving extra limbs on the tree, the leaf surface is increased, resulting in more growth and

earlier production. The extra limbs also help to produce wide angles by forcing the scaffold limbs to grow outward instead of growing in a more upright position.

To learn more about this system of pruning, in March of 1962, 458 one, two and three year old Delicious and McIntosh trees were selected for a pruning demonstration at the Marshall Orchard in Fitchburg. Approximately 1/2 of the trees were pruned the ordinary way with the complete removal of undesirable branches. On the remaining trees, the undesirable branches were shortened to about 6 to 12 inches. Trunk circumference measurements were taken at the beginning of the demonstration and during November, 1962 and 1963. The data in Table 1 show that the stub pruned trees made more growth, as indicated by increase in trunk circumference, than the trees pruned the regular way.

Table 1. Increase in Trunk Circumference of Stub Pruned Trees in Comparison to Those Receiving Regular Pruning.

Variety	Trees Planted	Avg. Increase in Trunk Circumference (3/62-11/63) Stub Pruned	Regular Pruned
		cms.	cms.
Delicious	1959	6.02	5.82
	1960	5.83	5.30
	1961	6.49	5.94
McIntosh	1960	6.17	5.36
	1961	5.86	5.69

The writer is of the opinion, however, that stub pruning only should be practiced by those growers who carefully prune young trees annually.

Sucker growth from many stubbed branches was 3-4 feet in length at the end of the first growing season. These very vigorous shoots from the stubbed limbs with narrow crotches were apt to be upright and interfere with the development of scaffold limbs above. It seemed necessary to cut back these vigorous shoots severely. Consequently, the writer suggests that most limbs with narrow crotches be completely removed rather than stub pruned in spite of the somewhat better overall growth where stub pruning is practiced.

Figure 1. The arrow points to the location where the branch was stubbed in March 1962. The limb originating from the stub bears the white tag. Picture taken November 20, 1963.

Sometimes a bud on the lower side of a stubbed branch will develop into a desirable shoot. As shown in Figure 1, the growth may be more horizontal than the branch from which it originates.

Therefore, stubbing of some branches with narrow crotches, which because of location would be desirable to keep, may be beneficial.

In conclusion, because of the necessity of annual pruning of the young trees to continually remove, replace or restrict the growth from stubbed limbs, the practice is only suggested for trial by growers that conscientiously prune young trees annually.

---William J. Lord

/ / / / / / / / / / / / / / / /

GROWTH IN CA STORAGE HOLDINGS IN MASSACHUSETTS

Approximately 50 per cent of the McIntosh crop in Massachusetts storages on November 1, 1963 was in CA and 40 per cent of the total stored crop was in this type storage (Table 1). Naturally, these percentages will fluctuate with crop size but the data clearly illustrates the rapid increase in CA storage holdings since 1956.

Table 1. Apple Storage Holdings in Massachusetts On November 1, 1956 through 1963.[1] (thousands of bushels)

	McIntosh		% of Stored	All Varieties		% of Total
Year	Standard Storage	CA Storage	McIntosh Crop in CA	Standard Storage	CA Storage	Stored Crop In CA
1956	730	118	12.9	1,232	118	8.7
1957	1,362	181	11.7	1,951	194	9.0
1958	1,012	397	28.2	1,594	442	21.7
1959	1,023	437	29.9	1,630	471	22.4
1960	646	473	42.3	1,162	486	29.5
1961	1,208	585	32.6	1,791	634	26.1
1962	929	610	39.6	1,483	698	32.0
1963	661	655	49.8	1,108	746	40.2

[1]Data obtained from the Special Apple Market Report.

---William J. Lord

/ / / / / / / / / / / / / / / /

PEAR VARIETY EVALUATION - 1963

Chapin - A seedling of Seckel that is harvested in early August. The fruit was small to medium in size, green with a red blush. Chapin resembles Seckel except for a more prominent neck. The flesh is fine textured, juicy, free of grit cells and of good quality.

Devoe - The fruit is a clear yellow often with a blush-red cheek, oblong pyriform in shape and of good quality. Devoe has been a heavy producer with a tendency to ripen unevenly. The fruit was harvested in the second week of September and held in storage until December. Devoe is worthy of trial.

Grand Champion - A russet sport of Gorham which it resembles in size, shape and quality. The fruit is overspread with a uniform "cinnamon" russet and is very attractive. The fruit tended to shrivel in storage. As this was our first crop, its productivity is undetermined.

Packham's Triumph - The fruit is large in size, greenish yellow in color, free from blemishes and although the surface is somewhat rough it is an attractive pear. The flesh is white, fine melting, free of grit cells and of very good quality. The fruit was harvested in late September and held up well into early January. As the fruit was harvested from a top-worked tree, an evaluation of tree characteristics cannot be given.

Alexander Lucas - A late ripening pear of medium size, smooth surface, obovate, obtuse-pyriform shape and greenish yellow color. The fruit is of good quality. Alexander Lucas was harvested in the third week of September and keeps well into December. Production appears to be satisfactory.

Dumont - A late ripening pear of medium size, obtuse pyriform shape and yellow color. The flesh is firm, juicy and the quality very good. The fruit was harvested in late September and kept well into early January. The variety has been productive under our conditions and is worthy of trial.

---James F. Anderson

/ / / / / / / / / / / / / / / / / / / /

POMOLOGICAL PARAGRAPH

Entering CA Rooms

Some operators of CA rooms are taking unnecessary chances when entering rooms to repair equipment. Some are using "make-shift" equipment; others enter the room by themselves. Never enter a sealed CA room without a suitable air mask or an oxygen mask. NEVER GO IN A CA ROOM ALONE.

Some growers borrow respirators from the local fire or police departments. Borrow at least two. Be sure that you know how to operate the equipment properly. Try it out before you go into the room. Be sure the tanks have a full charge of oxygen or air.

In some instances it is more desirable to purchase your own respiration equipment. Or else, several CA operators in an area can purchase the equipment jointly.

Your County Agent has information concerning where suitable equipment can be purchased.

---William J. Lord

/ / / / / / / / / / / / / / / / / /

LYGUS BUGS AS A CAUSE OF FRUIT DEFORMITY IN STRAWBERRIES

Deformed strawberries generally referred to as "cat-faced" or "nubbined" berries, occur commonly and sometimes abundantly in some strawberry plantings. Some of the causes of "cat-facing" are insects, weather, and lack of pollination. Furthermore, this injury can be directly attributed to the failure of individual achenes or seeds to stimulate receptacle development, either due to insect injury or to lack of pollination. Insect injury to the achenes can occur during the bud stage, during blossoming, or even during early fruit formation. Lack of pollination is more pronounced during years when early spring weather is cold as this results in the curtailment of bee activity.

An article published in the December issue of the Journal of Economic Entomology by W. W. Allen and S. E. Gaede, of the University of California, stated that even with adequate pollination achenes can be destroyed so that they do not stimulate complete fruit development. Their study showed that lygus bugs, such as our common tarnished plant bug, are important in destroying achenes both before and after pollination. They accomplish this by puncturing and injecting a poisonous substance into the individual achenes which stops development of the berry in the immediate area of the puncture. The most susceptible period for injury to occur is from the time the flowers open until the achenes have completed their enlargement. Since flowers are open for only a few days (3 to 4), whereas the achenes are enlarging for over a week (10 to 12 days), it becomes apparent that more damage may be caused by lygus bugs after blossoming.

It is possible to distinguish damage to berries whether caused by lack of pollination or by lygus bug attack. With lack of pollination, the achenes are all small and uniformly pale green in color. When the berries mature, the unpollinated achenes become somewhat collapsed but do not turn brown until the fruit is nearly ripe. With lygus bug attack, a few of the enlarged achenes in the cat-faced areas turn a light brown color long before the berries ripen.

Where lygus bugs are the cause of cat-facing, the application of insecticides will greatly decrease this damage. For current control recommendations on this

insect, consult your Pest Control Chart for Strawberries. The cat-facing in the ripe fruit arises from injury that was caused four or five weeks earlier, but by keeping a close watch on the developing fruit, it is possible to observe the effects of control in about two weeks.

---H. E. Wave

/ /

PRUNING BEARING APPLE TREES

The right perspective in regard to pruning is necessary when we attempt to relate it to the entire orchard operation. Many growers approach pruning in an apologetic fashion. They are likely to be on the defensive concerning the method used, for too much or too little pruning, or for over-emphasizing its importance.

Common opinions about pruning are that no two individuals prune alike or that it actually makes little difference how it is done as far as its final effect on tree growth and fruit production. There is often indifference to the importance of making the right cuts from the standpoint of effectiveness and efficiency of the pruning operation.

Although some differences in opinion on pruning exist, there are certain basic principles that should be followed in order to develop strong trees which are capable of high yields and the production of a large percentage of good quality fruit. One grower may select different limbs to cut than another. However, by following certain basic principles the end results are similar.

Finally, bear in mind that pruning reduces the number of growing points and total leaf area. Pruning is more likely to decrease rather than increase the total yield per tree, and the leaves are the food factories of the tree. Thereby, pruning should be limited to those cuts that will (1) eliminate weak wood, (2) allow even, light distribution throughout the tree, (3) change direction and/or height of growth, and (4) help spray coverage. Also, good pruning practices will reduce the yearly expense of this operation. Well pruned trees are easier and more economical to harvest.

Now that we have discussed the purpose of pruning, the following pruning tips may be of help. Even though the growth response to pruning is localized largely in the immediate area of the cut, detailed pruning should be eliminated whenever possible because of the time and expense involved. Bulk pruning (removal of large limbs that will "open" up the tree) should replace detailed pruning. This will help eliminate the practice of pruning the smaller fruiting wood along the main limbs with the end result of having the fruiting wood only at the periphery of the tree. Not only will the area in the inside of the tree become non-productive, because the removal of the fruiting wood, many water sprouts originate in the vicinity of the cuts which interfere with spray coverage and penetration of sunlight.

Keep small cuts larger than finger size. Decide what limbs should be eliminated and then remove them. Considerable time can be wasted in the decision

phase of pruning. The first impression is usually the best. When the tree is finished do not keep trying to find more cuts to make. They are relatively unimportant and slow up the pruning operation.

Organize your pruning! Make the most essential cuts first. You can then more readily determine the remaining cuts to be made. If you use a saw and lopping shears or pole pruner, a good system to follow is to make the necessary saw cuts from the ground and then in the top of the tree. After this is done prune with the lopping shears or pole pruners in the top and work back towards the ground and then finish the job with the shears from the ground.

Prune as follows:

1. Remove broken and diseased branches.

2. Remove water sprouts which are not needed to protect branches from sunscald or to provide for branch removal.

3. Eliminate crossing and parallel branches which tend to shade more desirable branches.

4. Remove weak drooping branches which are severely shaded and have few fruiting spurs.

5. Remove branches which are growing toward the center of the tree.

6. Remove suckers which arise at the base of the tree.

7. Reduce the height of excessively tall trees by complete removal of a branch or by heading back to a strong outward growing lateral.

8. Head back canopy forming limbs in the middle to top section of the tree.

Water sprouts in the tops of the trees present a problem when trying to control height. Retain those that tend to bend or encourage them to bend by the removal of shoots on the side opposite the desired direction of bending. If a "stiff" water sprout must be retained, head back to a strong lateral. The practice of merely heading back a water sprout will only encourage new upright growth from the promixity of the pruning cut.

---Max G. Fultz
Regional Agricultural Specialist

/ / / / / / / / / / / / / / / /

FRUIT NOTES

Prepared by Pomology Staff, Department of Horticulture
Cooperative Extension Service, College of Agriculture
University of Massachusetts, Amherst

MARCH 10, 1964

TABLE OF CONTENTS

Issued by the Cooperative Extension Service, A. A. Spielman, Dean and Director, in furtherance of the Acts of May 8 and June 30, 1914; University of Massachusetts, United States Department of Agriculture and County Extension Services cooperating.
Publication Approved by Alfred C. Holland, State Purchasing Agent, No. 44.

VARIETIES OF STRAWBERRIES FOR MASSACHUSETTS

Variety	Recommended for	Harvesting Season
Earlidawn	C	Very early
Midland	C & H	Early
Redglow	C	Early midseason
Surecrop	C	Midseason
Midway	T	Midseason
Catskill	C & H	Midseason
Fulton	T	Midseason
Robinson	C	Midseason
Fletcher	T	Midseason
Sparkle	C & H	Late
Frontenac	T	Late
Vesper	T	Very late

T - Trial   H - Home Garden   C - Commercial

Varieties so marked are not necessarily equally adapted to all sections of the State.

Variety Notes

Earlidawn - A very early ripening variety. The fruits are of medium size, firm and of fair to good flavor. The plants are productive and of moderate vigor. Earlidawn is recommended where red stele is not a factor.

Midland - An early ripening variety with large firm fruit of very good flavor. Midland produces many large, coarse berries and the berries are inclined to be dark in color. The variety, though a poor plant maker, has been a good producer. Good yields are obtained only with virus free plants. Midland is not resistant to red stele.

Redglow - This early-midseason variety is vigorous and productive. The berries are of good size, very attractive and of good flavor. Redglow is resistant to the common strain of red stele.

Surecrop - Recommended largely because of its resistance to several strains of red stele. The fruits are attractive, medium in size and fair to good in flavor. The plants are vigorous and moderately productive.

Midway - The fruit is of good size, a deep red color, glossy and very good in flavor. The plants are vigorous, productive and resistant to the common strain of red stele.

Catskill - A leading commercial variety with many growers because of its large size, attractiveness, good quality and vigorous, productive plants. Quite susceptible to leaf spot and requires a high level of fertility for good production. A good freezer.

Fulton - This new variety rates high in firmness, appearance and flavor. The plants are vigorous and productive. Fulton is not resistant to red stele.

Robinson - Its large, attractive, bright red fruit, high yield and abundant runner production have made this variety commercially important in many parts of the state. The quality and firmness of the fruit, however, are below average.

Fletcher - The fruit is of good size, attractive with very good flavor. The plants are vigorous and productive. Fletcher has rated slightly below Fulton in firmness, appearance, flavor and production in tests in Amherst. Fletcher is not resistant to red stele.

Sparkle - One of the important late season varieties. Its outstanding values are productiveness, firmness, good quality, and resistance to red stele disease. Berry size is medium to large in early pickings but tends to decline rapidly. It is rated as a good freezer.

Frontenac- A late ripening variety with vigorous and productive plants. The fruits are large, medium to dark red in color, good in flavor and moderate in firmness. Frontenac is not resistant to red stele.

Vesper - The plants are large, vigorous and productive. The fruit ripens late, is very large in size, attractive, moderate in firmness and good in flavor. Vesper has prominent protruding seeds. This variety merits trial because of its large size, attractiveness, lateness and productiveness. Vesper is not resistant to red stele.

-- James F. Anderson

/ / / / / / / / / / / / / /

POMOLOGICAL PARAGRAPH

Examine Apple Trees for Winter Injury

Winter injury to trunks of apple trees generally becomes apparent in April. It usually is necessary to thump the bark on the trunks to determine injury, since frequently no splitting occurs. A hammer is a satisfactory tool for this purpose.

Trees pruned in November and December may be more susceptible to injury. However, during the winter of 1962-1963 McIntosh trees pruned in January and February in two orchards had severe winter injury.

Gun-type staplers or air guns are efficient devices for tightening the bark to the wood on winter injured trees. With the gun-type staplers, 9/16 inch staples are suggested. The staples should be driven one to two inches apart to insure good bark-wood contact. Paint the injured area with a cold water soluble asphalt emulsion.

The air guns are operated from a compressor used for pneumatic pruners. One inch crown staples of 21/32 inch length are suitable for tightening the bark.

In 1963, one grower welded a handle on a mowing machine cutter bar section (serrated) which he used for scraping off the old shedding bark prior to stapling. Another grower scraped off the loose bark with the claws of a hammer.

-- William J. Lord

/ / / / / / / / / / / / / / /

SHOULD WE CONTINUE TO PLANT TREES ON E.M. VII ROOTSTOCKS?

The most popular size controlling rootstock in Massachusetts has been E.M. VII. Now another series of rootstocks, Malling Merton (M.M.), are being tested at various experiment stations and in growers' orchards, some of which may have distinct advantages over E.M. rootstocks. An excellent discussion of the performance of trees on E.M. and M.M. rootstocks was given by Prof. Karl Brase, New York Agricultural Experiment Station, Geneva, New York, at the Massachusetts Fruit Growers' Annual Meeting held at Gardner in January. His report will appear in the Report of the 70th Annual Meeting of the Massachusetts Fruit Growers' Association.

At present we have had more experience with the performance of trees on E.M. rootstocks than on M.M. Although trees on M.M. are worthy of trial, trees on E.M. VII are suggested for extensive plantings of McIntosh, until more is known about the performance of M.M. stocks.

Under some circumstances, trees on seedling rootstocks may be more desirable than those on size-controlling rootstocks, for example on exposed, windy sites. The need of size-controlling rootstocks for Red Delicious is doubtful. In many of our orchards, Red Delicious aren't excessively large trees, since they lack the inherent vigor of McIntosh in this region. Some growers believe they can control the size of seedling trees by pruning without too much difficulty. McIntosh on seedling roots has produced yields of 1000-1800 bushels per acre in Massachusetts.

We feel the final decision rests with the grower. Our obligation is to supply the best possible information upon which the grower can make his decision.

Recently, it has been suggested that growers plant trees on M.M. instead of E.M. rootstocks to avoid virus problems. Prof. Karl Brase provides the following thoughts on this subject, and he is quoted directly as follows.

> "Those who advise your growers to use the Malling-Merton rootstock clones instead of certain East Malling clones, because the former do not carry a latent virus or latent virus complexes, better first inform themselves about latent virus diseases in apple varieties and rootstocks.

Even among the MM group are clones that do not have a single mother plant that indexes virus free on certain indicators. The same is true of many of the so-called super strains of our well advertised varieties. There are latent virus diseases present in apple varieties as well as in certain apple rootstock clones. But before one condemns the use of certain rootstock clones, one has to prove that the latent virus actually affects growth, bearing, and the end product, namely the fruit.

Virus diseases that do harm, of course, should be eliminated - I am referring here to those with visible symptoms either on the tree or the fruit. As long as we do not know what effect the latent virus present in the rootstock has upon the variety, we should not condemn the use of the rootstock.

We have used EM VII and others in the EM group for more than 30 years successfully and shall continue to do so. As far as we know now, the latent virus present in EM VII has not affected in any way the varieties we have grown on this rootstock.

I see no advantage in the use of rootstocks free of latent virus if we have to grow on them varieties that carry also a virus in a latent stage.

It will take a number of years to prove or disprove that the latent virus present in EM VII is harmful and affects the performance of the trees. As long as this is unknown, growers should not be alarmed about it."

-- William J. Lord

/ / / / / / / / / / /

POMOLOGICAL PARAGRAPH

Soil Versus Leaf Analyses

"Fertilizers for Fruit Crops" was the title of an article by A.L. Kenworthy in the 91st Annual Report of the Michigan State Horticultural Society. In his article he mentions that experience has shown that there is a very poor relationship between soil tests and actual needs of fruit trees. Leaf analysis is the most reliable diagnostic method. Leaf analysis combined with a thorough knowledge of the crop considered will provide the most reliable method of determining fertilizer needs for fruit crops.

-- William J. Lord

/ / / / / / / / / / /

APPLE MARKETING OUTLOOK

The apple marketing situation is discussed by Fred Perkins, Department of Agricultural Economics and Marketing, Rutgers, New Brunswick, New Jersey in Economics Information Report No. 2. Below is his analysis of the factors that affect the future of the apple industry.

"Production Trends

During the recent five year period 1959-1963, the U.S. apple crop amounted to 126.8 million bushels, 108.5 million, 126.7 million, 125.4 million, and 122.8 million, for an average annual crop of 122.1 million bushels.

Statistics show that the production trend for most major producing areas in the U.S. is upward, indicating increases of more than 10 million bushels can be expected to provide average national crops of from 130 to 135 million bushels by 1966. There is also the further possibility that if all producing areas in the U.S. should have favorable weather conditions in a given year, a bumper national crop of some 147 million bushels might result.

Varietal Plantings

Nationally, the variety to increase most heavily in the future is Red Delicious. As a percentage of total production, slight increases will also occur for Winesap, Rome and Golden Delicious; while decreases will occur for the McIntosh, Staymen and York varieties.

Population Estimates

The U.S. population and the U.S. production of apples are both expected to increase a total of 8.5 per cent over the next five years for an annual increase of about 1.7 per cent. This means that apple consumption must continue at its present level if the industry is to maintain its position over the next five years. On the brighter side, the statistics show that the composition of the population will be such in five years that 22 per cent of the people in the U.S. will be under 10 years of age and 49 per cent will be under 25 years old. Therefore, the increase in population and shifts in its age classifications may help the apple industry - if more younger people are encouraged to eat and enjoy apples.

Consumer Patterns

In the early '20's, the total annual consumption of apples averaged more than 50 pounds per person, but over the years it has decreased appreciably. For the period 1941-50, total apple consumption averaged 30 pounds per person, compared to 28 pounds for the last 10-year period, 1951-60.

During this period, fresh sales of apples decreased an average of four pounds per person; canned sales increased two pounds, while other processing uses remained relatively unchanged.

This downward trend in consumption has been influenced by shifts in the demand for apples brought about by population changes, improved incomes, new trends in consumption preferences and changes in the status of substitute or competing products.

Per capita disposable incomes in the U.S. has been steadily increasing over the years and is expected to continue to rise. This should result in a good future demand for apples - if strong promotional efforts are continued.

Storage Trends

During the period 1946-60 about 44 per cent of the U.S. production of apples was placed in refrigerated storages. This volume has increased gradually to approximately 54 per cent of the 1963 crop being placed in cold storage.

Revolutionary changes in the methods used to hold apples have occurred in very recent years with the introduction of C.A. (controlled atmosphere) storage. In 1946, a total of 76,500 bushels of apples were stored in C.A. Today nearly 10,000,000 bushels are stored in C.A., of which nearly one-quarter are in Tectrol storage. These C.A. stored apples have met with good buyer reaction.

McIntosh, Delicious, Jonathan, Rome, and the Newton have accounted for the major varieties commercially stored to date in C.A.

Fairly substantial increases in C.A. storages throughout the country are still likely, even though the high premium price received will probably not be received to the extent that it has in the past.

As C.A. storage holdings increase, two things may happen: (1) larger quantities of apples might be sold later in the year than has been the custom in the past, and as a result, apples will become more available to Mrs. Consumer on a twelve month basis, or (2) more apples from C.A. will be sold earlier in the year than has been the practice in recent years, which may force greater competition on those selling apples from regular storage late in the season. Given a choice, buyers will choose C.A. apples over regularly stored apples - even at a slightly higher premium. (Very likely--both possibilities outlined above will occur).

Price Trends

Generally speaking, apple prices are influenced by two key factors--supply or quantity available and demand, which is the volume of apples consumers will purchase at various price levels. From statistical studies, it is estimated that about 96 per cent of the year-to-year fluctuation in apple prices is explained by variations in the size of the crop and changes in consumer income.

A 1 per cent increase in production is estimated to decrease prices by nearly .8 per cent, where a 1 per cent increase in income will up prices by about 1 per cent.

Since 1949, there have been nine years when the total U.S. apple crop was more than 110 million bushels. For these years, the price received by growers averaged $1.61 per bushel. This compares to $2.12, or an average difference of 51 cents per bushel, for the five years during the same 14-year period when the total U.S. production was less than 110 million bushels.

Ways to improve prices include producing quality apples, improving grade standards, using better packages, selling at roadside, conducting direct delivery programs, developing specialized market outlets and, in certain cases, creating a customer desire for grower-identified apples. To maximize income, the individual grower should seek the most profitable grades and quantities of apples to sell in line with his own particular situation. Collectively, growers must encourage greater demand and increased consumption of apples.

Export Prospects

Traditionally, the apple has played an important role in the U.S. export trade. However, while apples got off to a strong start a century ago, their present position in the export trade has been considerably reduced. During the five-year period 1934-39, on the average about 10 per cent of the U.S. apple crop was exported. For the period 1957-61 this percentage had dropped to slightly over 3 per cent. In 1962, only about 2.3 per cent of the U.S. apple crop was exported. As apple production in Europe trends upward, future prospects for the export market in Europe appears less favorable than in the past."

-- William J. Lord

--This article will be concluded in the April issue of Fruit Notes--

/ / / / / / / / / / / / / / / / /

FERTILIZER RECOMMENDATIONS FOR 1964

For the past several seasons, we have suggested reduced rates of nitrogen in those blocks which had a record of poor fruit color. Growers who have reduced or omitted nitrogen in some blocks may feel that the nitrogen level is now too low. Growers have two possible choices - they can increase the rate of nitrogen application, or they can maintain the present rate and apply a urea spray around first cover if the foliage indicates a low level of nitrogen.

Another factor to consider in determining the rate of nitrogen application is the amount of pruning which the trees receive. Trees which have received a heavy pruning will require less nitrogen than trees lightly pruned.

The suggested rates of fertilizer for normal applications are the same as in former years.

Normal Rates of Fertilizer for Bearing Apple Orchards

	Approximate Amounts per Tree					
Potential bushel yield of tree	Nitrogen required	Potash required	Ammonium Nitrate	Nitrate of Potash or	0-15-30	8-16-16
	Pounds	Pounds	Pounds	Pounds	Pounds	Pounds
Less than 15	0.66	1.3	2.0	2.1	4.3	8
15 - 25	0.66-1.00	1.3-2.0	2.0-3.3	2.1-3.3	4.3-6.6	8-12
More than 25	1.33-2.00	2.7-4.3	4.0-6.0	4.5-7.9	9.0-14.3	16-25

The suggested amounts of materials to apply in the table are for hand applications under the spread of the branches. When the materials are broadcast over the entire orchard floor it may be necessary to increase the rate of application in order to obtain the same tree response as with the hand applications. Fertilizer materials other than those given in the tables may be used so long as they are applied at rates which provide equivalent amounts of nitrogen and potassium.

The tree's magnesium and calcium requirements can best be met by maintaining an adequate dolomitic liming program. The pH of orchard soils should be maintained between 6 and 6.5. If a soil test shows that the pH of soil is 5.5 or below, magnesium sulfate sprays should be applied to prevent possible occurrence of magnesium deficiency. It takes from three to five years before dolomitic limestone is effective in correcting magnesium deficiency. When magnesium sulfate sprays are used, apply two to three sprays of epsom salts at the rate of 20 pounds per 100 gallons of water. These sprays should be timed by calyx, first and second cover sprays. To avoid possible incompatibilities, the epsom salt sprays should not be combined with the regular insecticidal and fungicidal sprays.

Boron should be applied to orchard soils every three years. Borax is the most common material used. The rates of application per tree vary with age and size. Apply one-quarter pound of borax to young trees, one-half to three-quarters pound to medium age and size trees, and three-quarters to one pound to large or mature trees. Boron may be applied as a foliar spray on a trial basis. Polybor-2 or Boro Spray applied at one-half pound per 100 gallons of spray one and three weeks after petal fall have given satisfactory results in New York State.

The amounts of fertilizer applied to trees which have received annual applications of 200 pounds or more of hay mulch per tree may be materially reduced or entirely eliminated. Tree performance should serve as a guide in determining the extent to which the rates of fertilizer may be reduced.

In young, non-bearing orchards, it may be possible to produce sufficient high quality mulching material for the young trees by broadcasting 500 to 800 pounds of mixed fertilizer per acre. Place the mulch in a band under the spread of the branches. The amount of fertilizer required for the trees with this system of culture will vary with the quantity and quality of mulch applied around each tree. If the trees are not making sufficient growth, one-eighth pound of ammonium nitrate per year of tree age may be applied to the mulch.

Recommendations for fertilizing peach orchards are given in the following table. The amounts given may need to be increased, if the trees are in a heavy sod. A suggested increase would be to double the amount of nitrogen.

Normal Rates of Fertilizer for Bearing Peach Orchards

Approximate Amounts per Tree

Tree Age	Ammonium Nitrate	Muriate of Potash or	0-15-30	8-16-16
	Pounds	Pounds	Pounds	Pounds
3 - 6	½-1	1-2	2- 4	2- 4
6 - 9	1 -1½	2-3	4- 6	4- 6
9 - 12	1½-2	3-4	6- 8	6- 8
12 & over	2 -4	4-8	8-12	8-16

-- Walter D. Weeks

/ / / / / / / / / / / / / /

FRUIT NOTES

Prepared by Pomology Staff, Department of Horticulture
Cooperative Extension Service, College of Agriculture
University of Massachusetts, Amherst

APRIL 10, 1964

TABLE OF CONTENTS

Issued by the Cooperative Extension Service, A. A. Spielman, Dean and Director, in furtherance of the Acts of May 8 and June 30, 1914; University of Massachusetts, United States Department of Agriculture and County Extension Services cooperating.
Publication Approved by Alfred C. Holland, State Purchasing Agent, No. 44

COUNTY EXTENSION AGENTS IN SUPPORT OF THE FRUIT PROGRAM

BARNSTABLE	Oscar S. Johnson, County Extension Agent in Agriculture, Cape Cod Extension Service, Barnstable (Tel. FOrest 2-3255).
BERKSHIRE, FRANKLIN, HAMPDEN and HAMPSHIRE	G. Everett Wilder, Pioneer Valley Extension Agent in Agriculture, Hampden County Improvement League, 1499 Memorial Avenue, West Springfield (Tel. Springfield REpublic 6-7204)
BRISTOL	Harold O. Woodward, County Extension Agent in Agriculture, Bristol County Agricultural School, Center Street, Segreganset (Tel. Dighton NOrmandy 9-3611 or 9-2361).
DUKES	Ezra I. Shaw, County Extension Agent in Agriculture, Dukes County Extension Service, Vineyard Haven (Tel. Vineyard Haven 694).
ESSEX, MIDDLESEX and WORCESTER	Max G. Fultz, Regional Agricultural Specialist, Middlesex County Extension Service, 19 Everett Street, Concord (Tel. Concord EMerson 9-4845)
NORFOLK	Howard Wilson, County Extension Agent in Agriculture, Norfolk County Agricultural School, 460 Main Street, Walpole (Tel. Walpole MOntrose 8-0268 or 8-0269).
PLYMOUTH	Dominic A. Marini, County Extension Agent in Agriculture, Plymouth County Extension Service, Court House, Brockton (Tel. Brockton JUniper 6-4993).

All pesticide chemicals mentioned in this publication are registered and cleared for the suggested uses in accordance with federal laws and regulations. Chapter 727, Acts of 1960, Commonwealth of Massachusetts requires that all pesticides sold in Massachusetts be registered with the Massachusetts Department of Public Health. Trade names, where used for clearness, do not indicate endorsement nor imply that similar products are not satisfactory.

WARNING! MOST PESTICIDES ARE POISONOUS. READ AND FOLLOW ALL DIRECTIONS AND SAFETY PRECAUTIONS ON LABELS. HANDLE CAREFULLY AND STORE OUT OF REACH OF CHILDREN, PETS AND LIVESTOCK.

THE ROLE OF BEES IN THE POLLINATION OF DECIDUOUS FRUITS

F. R. Shaw
Department of Entomology
and Plant Pathology

The principal insects of value in the pollination of fruit in New England include honey bees, solitary bees and bumble bees. Honey bees overwinter as colonies consisting of a queen plus many thousand workers. Solitary bees include a great number of species. These pass the winter in the adult stage in sheltered locations. In the spring, each female constructs her own nest, usually in the soil, collects pollen and nectar, and lays an egg in each cell. True colonies are not formed. Bumble bees, like solitary bees, hibernate. In the spring, the fertilized females construct their nests, obtain food and rear young. These are worker bumble bees. The workers help to enlarge the colony by gathering pollen and nectar and tending to the young.

Relative Importance of Different Kinds of Bees for Pollination

1. Honey bees are the only pollinating insects that can be increased in numbers and located where needed, from a practical viewpoint.

2. Honey bees are less dependent on favorable weather for flight than solitary bees. Bumble bees are superior in this respect.

3. Honey bees are more constant to a single species of plant when collecting nectar or pollen than are solitary bees or bumble bees. Investigations in Canada have indicated that honey bees are 80 per cent constant, solitary bees 55 - 70 per cent and bumble bees 65 per cent.

Characteristics of Colonies Most Suitable for Pollination

1. Should be strong. It is suggested that there should be sufficient bees to cover 5-6 frames as a minimum (determined by checking colony when temperature is 60-65° F.) Such colonies should be sending 40-50 bees per minute at these temperatures unless rain, wind, light or other factors are unfavorable.

   Farrar made comparison of flight rate of different types of colonies during pollination period. A portion of his data is reproduced below:

Type of colony	Temperature 90° F. Relative Humidity 50%	Average No. bees flying per minute
3 lb. package		15
5 lb. package		50
3.5 lb. overwintered colony		65
7 lb. overwintered colony		128

2. Colonies should be queen right.

3. Colonies should be disease free.

Number of Colonies Needed Per Acre

An old "rule of thumb" recommendation was one colony per acre. We now recognize that it is difficult to select a standard that will apply under all conditions due to variation in populations of pollinators naturally present, weather factors, colony condition, exposure of orchard and other factors.

Location of Colonies in Orchard

Most recent investigations demonstrate the advisability of placing colonies in groups throughout the orchard taking advantage of natural wind breaks or providing artificial cover if necessary. Colonies should face south or southeast.

When to Move Colonies Into the Orchard

It is not recommended that bees be placed in orchard ahead of bloom since the bees may become trained to visit other flowers. It is suggested that the colonies be moved in when bloom has opened or even to wait a day or so if conditions for flight appear to be satisfactory.

Some of the Problems Facing Beekeeper Who Rents Bees for Pollination

1. Loss of queens or colonies during moving.

2. Swarming.

3. Exposure to disease.

4. Exposure to pesticides.

How Bees May Be Poisoned

1. Contamination of water, nectar or pollen with pesticides which have stomach poison action on bees. Contaminated water and pollen may kill both the brood (immature bees) and the adults. Poisoned nectar kills mainly adult field bees but there are some exceptions depending on speed of action of pesticide and distance bees have to fly.

2. Direct contact with pesticide during application, adult field bees are primarily affected but brood may die from neglect. (Starvation or exposure to extremes of temperature).

3. Exposure to pesticides having prolonged residual action. In some instances heavy mortalities have resulted from exposure to residues on leaves, twigs, or blossoms on which bees may crawl or rest.

Comparative Toxicity of Pesticides to Honeybees

Anderson and Atkins (University of California) set up four groups of pesticides based on their comparative toxicities to bees. Much original information was presented, some of which was obtained from laboratory experiments. Most of the more important materials were also tested in the field. It must be emphasized that weather conditions in California may influence the effects of most pesticides so as to give very different results than we might obtain in the Northeast.

1. Materials that are toxic to bees which should not be used if there is a possibility of bee poisoning at the time of treatment or within several days thereafter:

BHC	dieldrin	lindane
calcium arsenate	Guthion	parathion
Diazinon	lead arsenate	carbaryl (Sevin)

2. Materials that are highly toxic to bees but which may be used if certain precautions, involving proper method and timing of application, recommended dosages and avoidance of high temperatures, are followed:

malathion	Phosdrin	TEPP

3. Materials that are only moderately toxic to bees which may be used if dosage and timing are correct. Should not be applied directly on bees in the field or on the colonies:

chlorobenzilate	endrin	endosulfan (Thiodan)
TDE (DDD)	ethion	carbophenothion (Trithion)
DDT	tetradifon (Tedion)	

4. Materials that are relatively non-toxic but deliberate spraying of bees even with these materials should be avoided.

captan	Karathane	demeton (Systox)
dodine (Cyprex)	methoxychlor	thiram
dioxathion (Delnav)	chlorobenzide (Mitox)	2,4-D
ferbam	ovex	2,4,5-T
Genite	sulfur	

What Is Being Done to Reduce Danger of Poisoning?

1. Research on comparative toxicities of pesticides to bees. This provides information of value in making recommendations for the use of such materials.

2. Investigations on possible use of substances repellent to bees. These would be included in sprays in order to cause bees to avoid treated surfaces.

3. Extension specialists recognize danger of poisoning and recommend measures to minimize poisoning. Among these might be (1) proper timing to avoid pesticide applications to plants attractive to bees while in bloom, (2) applications in early morning or in evening when fewer bees will come in direct contact with poison, and (3) avoidance of contamination of area where spraying or dusting equipment is being filled, particularly if there is standing water in vicinity by bees.

Suggestions to Improve Grower-Beekeeper Relations

Have definite agreement as to:

1. Number of colonies wanted.

2. Strength of colonies.

3. When colonies are to be moved in and out of orchard. Beekeeper needs 48-72 hours notice.

4. Distribution of colonies in orchard.

5. Avoidance of use of harmful pesticides while bees are in orchard.

6. Rental price with terms of payment.

/ / / / / / / / / / / / / / /

GET GOOD STRAWBERRY PLANTS IN WELL PREPARED SOIL

John S. Bailey
Department of Horticultural
Science

The importance of starting with good strawberry plants is becoming increasingly more evident. Good plants are not only free from disease but also in good physical and nutritional condition (well developed plants with a large crown and root system, high in food reserves and mineral nutrients).

In a recent Report of the Committee on Deciduous and Small Fruits of the Council on Fertilizer Application, it is stated, "The pre-planting application of fertilizers is gaining acceptance among the growers of small fruits, especially strawberries. The sensitivity of the strawberry to nitrogen and potassium salts is well known. In order to avoid this effect, the green manure crop is fertilized heavily the season before the land is to be set with strawberries. This system seems to work very well and its use will probably increase." This statement is worthy of more attention and more thought.

A strawberry plant grower of my acquaintance has for years made a practice of turning under large amounts of heavily fertilized green manure crops before setting strawberry plants, and subsequently applying no more fertilizer. The result has been unusually large, vigorous daughter plants.

In some of our experimental work with strawberry plants, we started out with virus-free plants which were unusually large and vigorous. There was no response to a large variety of fertilizer treatments. These plants were probably so high in nutrient reserves as a result of unusually high soil fertility in the nursery that they needed little, if any, fertilizer the following year.

This all points to two very important practices in starting a strawberry bed. First, get your soil well prepared by turning under heavily fertilized green manure crops (or farm manures. if available). Second, obtain good vigorous plants

high in mineral and food reserves. Such plants will really "take off" and grow.

Remember that good plants mean plants free of all disease, not just virus-free. Be especially careful not to bring red stele into your bed. Also, be fussy about the size and vigor of the plants. The free plants obtained from a neighbor may not be so cheap in the long run.

/ / / / / / / / / / / / / / /

APPLE MARKETING OUTLOOK

Fred Perkins
Department of Agricultural
Economics and Marketing
Rutgers

--Continuation of the article that appeared in the March issue of Fruit Notes in which Fred Perkins analyzes the factors that affect the future of the apple industry.--

"Packaging Trends

In recent years, there has been a tremendous increase in the sales of fresh prepackaged fruit and vegetables in the U.S. Today, consumer packages must have eye appeal. They must provide for convenience, be reasonable in cost and give greater confidence in the quality and freshness of the contents.

The most widely used consumer package for apples is the polyethylene bag. It is estimated that from 35 to 45 per cent of all apples are sold at retail prepackaged in bags. Medium to large size apples, however, do not fit well into 3 to 5 pound capacity bags--further, there is little protection afforded to these larger apples from bruising.

Especially promising, for display and protection, are the newly developed shrinkable films now used widely on some commodities and on a test basis for others. (These over-wrapped packages usually hold from 6 to 8 apples).

Let's take a look at the shrink film situation for apples. There is general agreement that volume production offered by shrink film operations offers real potentialities of reducing the cost of packing apples in consumer trays over former techniques and that bruising, especially to the larger sized and easily bruised apples, is substantially reduced over bagging by using consumer tray packs.

With twenty or more suppliers of equipment and various films, however, the job of selecting the best product or material to use becomes difficult. Perhaps the best general concensus of opinion is that no one product now on the market is highly recommended by all users (not

manufacturers) to be the best in every respect. A number of users expressed concern over wrinkling of the film, costs, condensation, etc. Some packers feel that large volumes are required to justify high overhead costs of equipment and therefore shrink film packaging can be best used by large growers or packers who can specialize and lower their per unit packing costs.

Some retailers and chain store organizations have been reluctant to pay a slight premium for prepackaged apples to help offset the added cost involved in shrink film packages, even though their net profits might be increased.

There are people closely associated with the industry who say that shrink film packages are primarily supplementary in nature and should be used along with bagged apples to maximize sales. Others feel that the total consumer acceptance for some tray packed apples has not yet been adequately proven. Some retailers advance the theory that to maximize sales we should be thinking of even larger units especially at harvest time, during the Halloween season, and on other special occasions.

There is no question that polyethlene jumble-filled bags and shrink film packages are here to stay. From a grower standpoint, it appears presently that tray packages are proving most advantageous to distant shippers and producers who are handling large volumes of the softer flesh varieties of apples.

Competition

From the marketing aspect, the time has passed when producers can rely heavily on local buyers to sell their apples to, without meeting strong competition from other producing areas and from a multitude of highly advertised and competitive items being offered for sale to consumers. The marketing pattern for apples with few exceptions has now become exceedingly more complex.

U.S. apple producers must continually do a better job of meeting the price, quality and services offered by competitors.

Some of these needs can best be met by individuals, while others require the joint effort of all producers, well organized and working together in harmony, to do the job. Only those producers who are willing to recognize the changes taking place in the apple industry today and who are willing to adjust their operations accordingly will continue to be successful in the apple business in the years ahead.

Costs and Efficiency

In many cases, efficiency is the most critical factor in determining whether a profit or loss results from the production and sale of apples. Present economic conditions in marketing apples indicate an efficiency of the highest degree is needed in order to be successful in today's extremely competitive situation.

Efficiency calls for the adoption of new production practices to lower costs while producing a quality product. In addition, improved handling, storing, grading and packaging practices and selling techniques for apples are needed.

As the trend toward specialization and increased size of business in the apple industry continues, added emphasis must be continuously devoted toward improving accounting procedures and obtaining information to make better management decisions."

/ / / / / / / / / / / / / / /

CHEMICAL CONTROL OF WEEDS IN THE ORCHARD

William J. Lord
Extension Pomologist
Department of Horticultural
Science

Chemical weed control should not be considered as a substitute for mulch, but as an aid in orchard management, when insufficient mulching material is available. Then, it is suggested that herbicides be applied only to the grass that can't be machine mowed under the trees.

In general, the results from herbicide applications have been satisfactory. However, successful use of herbicides requires close attention to details. Fruit trees have been severely injured or killed by over-dosage with herbicides.

While several herbicides are labeled for use in apple and pear orchards, only dalapon may be used under bearing peach trees. However, peach trees are easily injured with this material.

Our experimental results of the past two years indicate that amizine or amitrole-T (commercial product Amitrol-T) plus diuron or amitrole-T (Amitrol-T) plus simazine may give partial control of poison ivy plus grass control if applied just prior to fruit set. Although these materials will not give complete control of poison ivy with this timing, they should help prevent the rapid influx of this weed in the area where grass has been controlled.

Dalapon fails to control annual weeds. However, our results indicate that when the sod cover is mainly grass under bearing apple trees, dalapon may be the only herbicide necessary. The following year, simazine or diuron may be used with either dalapon or amitrol T (Amitrol-T). Amizine which contains amitrole and simazine also is suitable.

Dalapon is the only material labeled for use in bearing apple orchards after June 1 of any year. Diuron may be used up to June 1, and amizine, amitrole T (Amitrol-T) and simazine must be applied prior to fruit set of apples. The restriction on timing is similar in bearing pear orchards. However, amizine and simazine are not labeled for pear trees.

Our 1964 issue of Special Circular 283, Chemical Weed Control In The Orchard is now available through your County Extension Service or by writing to the Mailing Room, University of Massachusetts, Amherst, Massachusetts. This circular contains our suggestions for the use of herbicides labeled for orchards.

/ / / / / / / / / / / / / /

CHEMICAL THINNING OF APPLES

Franklin W. Southwick
Department of Horticultural
Science

The crop in most orchards in 1963 was not excessive on our leading varieties so I would anticipate a rather heavy bloom in many McIntosh blocks. Some chemical thinning may be desirable if good pollinating weather prevails at blossomtime and a late spring frost is not a serious threat. Some moderate thinning of heavy setting McIntosh trees is usually necessary to assure annual flowering. This is a much more important reason for thinning McIntosh in this area than the necessity for improving fruit size. On the other hand, many other early to late apple varieties need chemical thinning not only to improve the chances of annual flowering but also to significantly improve fruit size.

The problem of chemical thinning McIntosh has been given sufficient attention so that we know that it can be satisfactorily done with either NAD (Amid-Thin) or Sevin when these are applied from 1 to 3 weeks after petal-fall. Sevin is an extremely safe and reliable thinner over a very wide range of concentration. Data shown in Table 1 illustrate this point very clearly. Sevin thinned to the same degree at all concentrations from 1/4 to 2 lbs. per 100 gallons of water. Since Sevin has no temporary size depressing action on persisting apples and causes no visible foliar effects, it has these advantages over NAD. The primary advantage NAD has over Sevin as a chemical thinner of McIntosh is that NAD thinned trees may occasionally exhibit a heavier "return or repeat" bloom than similar trees thinned to the same degree with Sevin.

Table 1. The Influence of Chemical Thinners on Fruit Set and Size of McIntosh Apples. 1963.

Treatment[1]	Applied	No. of Trees	Fruits/cm. of Limb Circumference	Avg. Fruit Diameter[2] (Inches)
1. Check		6	7.0	2.64
2. Sevin - 1/4#	PF+18	6	5.6	2.69
3. Sevin - 1/2#	PF+18	6	5.7	2.70
4. Sevin - 1#	PF+18	6	5.8	2.71
5. Sevin - 2#	PF+18	6	5.5	2.70
6. NAD - 25 ppm.	PF+18	6	5.1	2.65

[1]Amounts of Sevin (50% wettable) used in 100 gals. of water.

[2]Fruit size measurements made Sept. 4, 1963 (35 fruits at random per tree).

Although Sevin is an excellent material for McIntosh and an outstanding material for thinning Delicious, it is such a mild thinner that it won't do an adequate thinning job on such heavy setting varieties as Early McIntosh. Table 2 shows its limitations on this variety.

Table 2. The Influence of Chemical Thinners on Fruit Set and Size of Early McIntosh Apples. 1963.

Treatment[1]	Applied	No. of Trees	Fruits/cm. of Limb Circumference	Avg. Fruit Diameter[2] (Inches)
1. Check		6	19.9	2.11
2. Sevin-3# + Tw.20 NAD-50 ppm.+Tw.20	PF PF+10	6	7.9	2.36
3. Sevin-3# NAD - 50 ppm.	PF PF+10	6	9.5	2.32
4. Sevin-3# + Tw.20 NAA - 20 ppm.+Tw.20	PF PF+10	6	7.6	2.47
5. Sevin-3# NAA - 20 ppm.	PF PF+10	6	6.9	2.41
6. Sevin-3# + Tw.20 Sevin-3# + Tw.20	PF PF+10	6	15.9	2.22
7. NAD - 50 ppm.+Tw.20 NAA - 20 ppm.+Tw.20	PF PF+10	6	7.2	2.46

[1]Amounts of Sevin (50% wettable) used in 100 gals. water. Tw.20 equals Tween 20 at 4 oz. per 100 gals.

[2]Fruit size measurements made August 6, 1963 (60 fruits at random per tree) about 2 weeks before harvest commenced.

The data in Table 2 show an exceptionally fine series of chemical thinning jobs done with applications of Sevin at petal-fall plus NAD or NAA 10 days later or by applications of NAD at petal-fall supplemented by NAA 10 days later. In addition, the use of Tween 20 as a wetting agent seems to be of slight benefit as far as increasing thinning and ultimate fruit size. On the other hand, two applications of Sevin (Treatment 6) even at 3 lbs. per 100 gallons each time was inadequate on these Early McIntosh. The story is not complete on these treatments, however, since we won't have "repeat bloom" data on these trees until later this spring. At this time it is rather certain that Sevin must be supplemented with either NAD or NAA in order to get adequate thinning on Early McIntosh.

We have been trying to get information on the new early variety, Puritan, in recent years. Since this variety is the result of a McIntosh-Red Astrachan cross, we anticipated that it would set heavily like virtually all other early apples and be quite biennial in production, as well. Table 3 represents some typical results on some 10 year old Puritans.

Table 3. The Influence of Chemical Thinners on Fruit Set and Size of Puritan Apples. 1963.

Treatment (per 100 gals.)	Applied	No. of Trees	Fruits/cm. of Limb Circumference	Avg. Fruit Diameter (Inches)
1. Check		10	6.4	2.53
2. Sevin 1#	PF+14	10	4.0	2.58

[1]Fruit size measurements made August 6, 1963 (30 fruits at random per tree) about 1 week before harvest commenced.

It is apparent from Table 3 that these Puritan did not need to be thinned with Sevin at all to obtain suitable fruit size. Similar results over the past few years and comparable observations by growers have convinced us that Puritan may be the rare early apple which doesn't often overset. Of course, all trees of this variety are relatively young and oversetting may become a problem as they get older. However, we suggest that young Puritan should not be chemically thinned even where interplanted with other varieties that are suitable cross-pollinizers. NAA and NAD should not be used on Puritan since they are apt to be quite injurious to Puritan foliage and very apt to overthin this variety.

Unfortunately, Puritan is extremely biennial even though it doesn't overset. We are now in the process of trying some other treatments that we hope will tend to induce annual flowering on this and other hard-to-make-annual varieties.

Details concerning chemical thinning of various apple varieties will be available in our Special Circular No. 189 sometime in April, as usual.

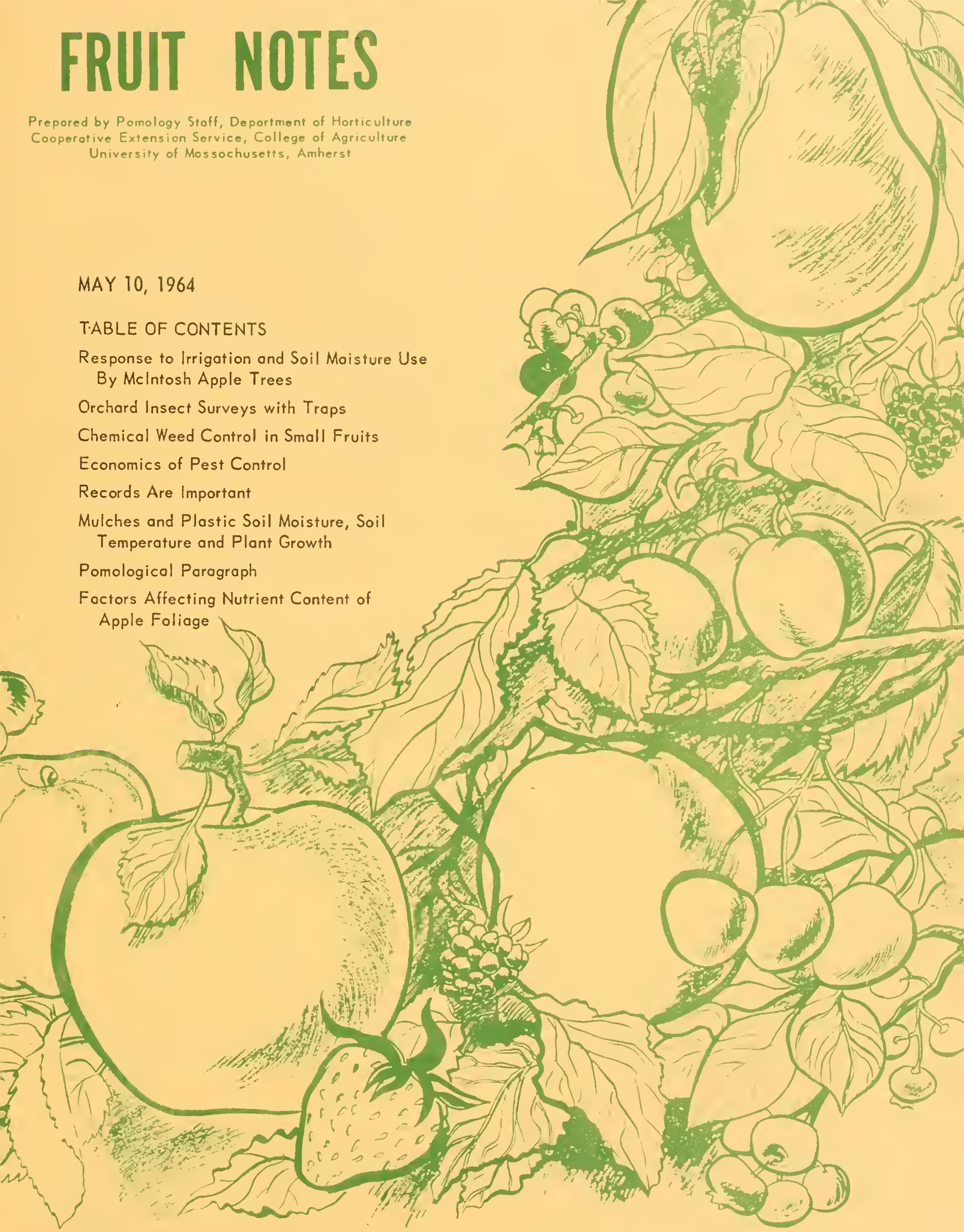
/ / / / / / / / / / / / / /

FRUIT NOTES

Prepared by Pomology Staff, Department of Horticulture
Cooperative Extension Service, College of Agriculture
University of Massachusetts, Amherst

MAY 10, 1964

TABLE OF CONTENTS



Issued by the Cooperative Extension Service, A. A. Spielman, Dean and Director, in furtherance of the Acts of May 8 and June 30, 1914, University of Massachusetts, United States Department of Agriculture and County Extension Services cooperating.
Publication Approved by Alfred C. Holland, State Purchasing Agent, No. 44.

RESPONSE TO IRRIGATION AND SOIL MOISTURE USE
BY MCINTOSH APPLE TREES

William J. Lord
Extension Pomologist
Department of Horticultural Science

The value of irrigation of McIntosh orchards located on the better soils in Massachusetts is questioned by L.F. Michelson, W.J. Lord and D.L. Field in their recent Massachusetts Experiment Station Publication No. 537, 1963.

The irrigation studies they report upon were conducted in a McIntosh orchard from 1956 to 1962, inclusive. In this investigation, the orchard was irrigated in 1957 and 1962, but a fruit growth response was obtained only in 1957. Even in this instance, some possible disadvantages of irrigation occurred. For example, 27% of the irrigated fruit had water-core, while only 4.3% of those from non-irrigated trees had the disorder in 1957. Twenty-four per cent of the irrigated fruit in 1957 was 3 inches or larger in diameter, but these larger apples are softer, more susceptible to bruising and are often less suitable for present markets than sizes 2 1/2 and 2 3/4 inches in diameter.

The orchard selected for the study was located on a soil with only 0.7 to 1.9 inch per foot moisture holding capacity. The majority of Massachusetts orchards are located on drumlins or drumloid hills with soil having an estimated available moisture holding capacity of more than 1.5 inches per foot of soil to a depth of 3 or 4 feet or more.

A major problem encountered in this irrigation study was the extreme variability of soil moisture measurements under a given tree and among adjacent trees. This variability illustrates the problem of obtaining a reliable estimate of the soil moisture available under apple trees.

Moisture extraction by individual McIntosh apple trees was studied. It was found that the degree of the moisture depletion increased, as the sampling location progressed toward the tree trunk.

Those persons interested in receiving a copy of Experiment Station Publication 537 may do so by writing the Mailing Room, University of Massachusetts in Amherst or your County Extension Service.

All pesticide chemicals mentioned in this publication are registered and cleared for the suggested uses in accordance with federal laws and regulations. Chapter 727, Acts of 1960, Commonwealth of Massachusetts requires that all pesticides sold in Massachusetts be registered with the Massachusetts Department of Public Health. Trade names, where used for clearness, do not indicate endorsement nor imply that similar products are not satisfactory.

WARNING! MOST PESTICIDES ARE POISONOUS. READ AND FOLLOW ALL DIRECTIONS AND SAFETY PRECAUTIONS ON LABELS. HANDLE CAREFULLY AND STORE OUT OF REACH OF CHILDREN, PETS AND LIVESTOCK.

ORCHARD INSECT SURVEYS WITH TRAPS

H.E. Wave
Department of Entomology
and Plant Pathology

An interesting item on fruit insect surveys appeared in the February issue of the Journal of Economic Entomology by E.R. Oatman, University of California Citrus Research Center, Riverside. This article describes a trapping method for detecting economically important species or orchard fruit insects in Wisconsin. The method described uses an all-directional light trap, which is equipped with a 15-watt BL (blacklight) fluorescent lamp mounted vertically between a single baffle. The lamp is enclosed by a cylinder of 1/4 inch screening to keep out insects larger than the codling moth. Cyanide granules were used to kill the trapped insects. Traps, operated through June, July and August were emptied and examined 3 times a week.

Insects trapped by this method included: Codling moth, red-banded leaf roller, eye-spotted bud moth, strawberry leaf roller and others.

Information obtained with the blacklight traps helped to establish the time of emergence, population abundance and seasonal distribution, including the number of generations per season of tha principal pest species. The timing and number of sprays needed for adequate insect control can be greatly improved through this method.

Some commercial growers in Wisconsin, taught to recognize the adults, operate their own light traps and disseminate the information gathered to others in the area.

* * * * * * * *

CHEMICAL WEED CONTROL IN SMALL FRUITS

J.S. Bailey
Department of Horticultural Science

Weeds are serious enemies of many crops including small fruits. Among the small fruits, strawberries are the most seriously hurt by weeds. Many a strawberry bed has had to be abandoned because weeds choked out the berry plants. The rapid development of weeds, during the first fruiting year with the resulting problem and expense of getting rid of them, is one of the chief reasons why strawberry beds in the northeast are fruited only once. If weeds were kept under control so that the bed could be fruited two or three years, the cost of growing berries could be considerably reduced.

With cultivated blueberries and raspberries, the problem is not quite so serious, because these plants grow above most weeds and, therefore, do not suffer from shading as strawberries do. They do suffer from competition for soil nutri-

ents and moisture. Most blueberry varieties are shallow rooted, at least most of their feeding roots are near the surface. This poses a double barreled problem. Deep cultivation to kill weeds can destroy many feeding roots. If the weeds are not eliminated, they compete with the blueberries and may reduce growth. Several years ago, I saw a row of blueberries part of which had been treated with a weed killer. The weed population was very small compared with that in the untreated part of the row. The leaves of the treated part were darker green, and chemical analysis proved they contained more nitrogen than the leaves on bushes in the untreated part.

Raspberries also have many of their feeding roots near the surface where weed competition can become a serious problem. This is particularly true if the rows are not kept narrow. A wide row with many plants is very difficult to keep free of weeds by mechanical means. The really good grower doesn't allow the rows to get more than a foot wide at the base. Even in a narrow row, weeding by cultivation is laborious and costly.

Chemical weeding has not entirely eliminated the need for cultivation and probably never will, but properly used, it can be a big help. Special Circular 215, "Controlling Weeds in Small Fruit Plantings with Chemicals" has recently been revised. Anyone wishing detailed directions for chemical weed control in small fruit plantings should send to the office of his county Agricultural Extension Service or to the Mailing Room, Massachusetts Agricultural Extension Service, Amherst, Massachusetts.

* * * * * * * *

ECONOMICS OF PEST CONTROL

Max G. Fultz
Middlesex County Extension Service
Concord, Mass.

The item of pest control in the apple operation is an expensive one. Compared with that of a decade ago, it actually has not increased in proportion to many other expenses of the operation. Compared with some twenty years ago, there is, however, some substantial difference. In spite of all the yearning for the good old days, however, the modern way has much in its favor.

A factor that has been injected with more emphasis over the years as an expense deterrent has been the sensational production increases. This has the same effect on the basic cost per unit of production as a reduction in expenses. What is even more important from the marketing standpoint is a parallel increase in percentage of well-colored, sound, generally high grade fruit. Despite the hazards of a complex and formidable line-up of chemicals, the percentage of russeted, rough-finished or netted fruit is less than it once was. This is in comparison with the old days, first of lime sulfur and then the milder sulfurs. Despite the great step forward taken with the advent of mild wettable sulfur fungicides, the further improvement has been marked with the introduction of organic fungicides with "kick-back" and arresting properties for better scab control and improved finish, if properly used.

Stating these advantages cannot be done lightly without at once recognizing the need for better understanding of the increasing number of chemicals. Such diverse selection means varying response to different weather conditions, to combinations with other materials in relation to compatibility, to variety differences, etc. As a matter of fact, in the days of limited choices of fungicides and insecticides, one could predict with considerable certainty the results of simple combinations such as arsenate of lead and sulfur. In other words, injury to foliage or fruit, although admittedly not occurring so often, still may happen as a surprise and is not always easy to explain.

Accordingly, the economics of pest control demands a very good balance of judgment. Most growers will accept a little more outlay for materials that will produce the result desired. Most are not inclined to omit a spray if there is reasonable doubt about the feasibility of doing so. This decision cannot be mathematical, for one can suffer much more in actual loss and down-grading of fruit than can possibly be saved by leaving out one application. A fallacy in figures that is too frequently presented is gauging the percentage of control to the operation. For instance, 90 percent control cannot be set as a point of attaining the most profit. Nor can this be set at 75, 80 or any other per cent. On paper, however, it is possible to produce figures of diminishing returns above a certain point. The trouble is that pest damage often occurs so quickly that the stopping point in percentage cannot be accomplished short of disaster.

All of this does not mean, nevertheless, that one cannot achieve pest control effectively and still inject efficiency and practical saving into the job.

Emphasis should be placed on dosing correctly. Those who feel that "if a little will do good, drastically increasing the mixture strength will do better" waste money. They also increase chances for foliage and fruit injury and damage to fruit finish. The residue problem is increased. With concentrating of materials more or less common, it has become increasingly important to figure dosage accurately.

The operation of the equipment can affect greatly the cost of pest control. Applying too much can have the same results as indicated with mixing too strongly. On the other hand, poor results will occur if the mixture is too weak or the application too light, not distributed well and generally not thorough. With air blast sprayers, accuracy in operation pays in money. Gallons per tree is the index and observing the coverage in application and deposit comprise the check. All are essential--tractor speed, nozzle capacity and nozzle arrangement and adapting the rig to the job. Substantial checking as the season starts and as conditions change during the season will go far towards accurate, efficient operation of the rig.

For setting up the air blast sprayer for proper delivery this formula has been used effectively over the years. It will bear repeating here.

$$\begin{array}{c} \text{Gallons per minute per} \\ \text{sprayer side} \\ \text{required for average tree} \\ \text{in block at given speed} \end{array} \text{ equals } \frac{\begin{array}{c}\text{Rate of travel in}\\ \text{feet per minute (F)}\end{array} \times \begin{array}{c}\text{One half of dilute gallonage}\\ \text{required per tree (G)}\end{array}}{\begin{array}{c}\text{X concentration}\\ \text{desired}\end{array} \times \begin{array}{c}\text{Average tree spread in feet (S)}\\ \text{or}\\ \text{Distance between trees (D)}\end{array}}$$

$$R = \frac{F \times 1/2\ G}{X \times S \text{ or } D} \quad \text{Also this has been written } R = \frac{F \times G}{2 \times X \times D \text{ or } S}$$

Another variation is that some feel that the distance (D) between trees in large bearing orchards rather than the actual spread (S) is accurate enough.

Pest Control is critical. It can make or break the operation.

* * * * * * * * * *

RECORDS ARE IMPORTANT

E.H. Wheeler
Department of Entomology
and Plant Pathology

Records of pesticide applications, complete and accurate records, can help growers in many ways.

They protect the food or feed producer - the growers, should any questions arise concerning pesticides used and the possibility of residues.

Records help producers make better management decisions based upon results obtained earlier that season or in previous years.

Regulations established by the Food & Drug Administration do not require the keeping of such records. However, records do help a producer explain to inspectors what he has been using and when he used it. The absence of records may lead an inspector to suspect that something is wrong.

If no records are available, prospective buyers may ask to have a sample of the food or feed product analyzed for pesticide residues before completing the purchase contract. The producer would be expected to stand the expense of such an analysis.

Trade names are not enough to identify the chemical used. Any user of a pesticide on food or feed crop should know the identity of the chemicals, the active ingredient(s) in the trade-named product.

Records should show the identity of the active ingredients, the type of product used such as wettable powder, dust, granular or liquid, the dosage per 100 gallons or per acre, the number of applications and the dates of those applications.

Any producer who keeps accurate records on the points suggested above can prove to anyone very easily that he knows what he is doing.

Any producer who follows label directions or other sound, up-to-date recommendations should have no worries when his records are examined or his produce analyzed.

READ and FOLLOW DIRECTIONS or LABELS. KEEP RECORDS OF PESTICIDE USE.

* * * * * * * * * *

MULCHES AND PLASTIC SOIL COVERS AFFECT SOIL MOISTURE, SOIL TEMPERATURE AND PLANT GROWTH

Martin Weeks
Department of Agronomy
and
William J. Lord

Mulches include any protective material or covering that rests on the soil. They have been used for centuries by farmers, gardeners and fruit growers to protect plants from drought and weed competition and to prevent rapid changes in temperature from injuring root systems. Mulching materials in these early times have included dust, gravel, a variety of organic materials such as straw, old hay, manure or leaves. It has always been difficult to obtain sufficient quantities of the natural materials that are free of weeds or other objectionable constituents. For this reason, in recent years paper and plastic mulching materials have been produced together with machinery that aids in applying them uniformly to the soil.

Mulches are used mostly in accordance with rule-of-thumb experience either of the grower himself or of his neighbors. Since some of these mulches and plastic covers do have a pronounced effect on soil climate the principles governing their effects should be of interest.

Porous mulches permit more-or-less evaporation of soil moisture depending on the material. Whether they conserve any moisture may depend on the length of time between rains and the degree to which they prevent runoff. Also, their effect on transpiration plays some part in conservation. In a controlled experiment, workers at the Iowa Agricultural Experiment Station found recently that unmulched soil evaporated 1.25 to 5 times more water than mulched soils in a given time. In this work a gravel mulch was most effective, a corn cob mulch less so and a dust mulch least effective in retarding evaporation from the soil surface. Orchardists in some areas have traditionally used a straw, hay or manure mulch in combination with sod cover. One effect of this practice was to supply nitrogen and some potassium to the trees. It has been especially beneficial at times on shallow soils. One disadvantage is the fact they form conditions favorable for mice.

During the last two or three years, grower interest has developed concerning the use of plastic as a means of weed control under non-bearing trees. The question has been asked as to the effect of plastic on soil temperature and moisture.

Waggoner, et al. (Conn. Agr. Exp. Stà. Bul. 634) have made an extensive study of plastic mulching: its principles and benefits. Their results show that in the spring, black plastic has little ability to warm the soil. On the other hand, clear plastic has great ability to warm the soil, and their data show that the depth of soil thawing on March 17, 1958 was double that of under black plastic. Aluminum film and hay mulch both retarded the warming of soil.

The data obtained by Waggoner, et al. show that during the summer months soil temperatures were 4 to 10 degrees higher under clear plastic than under a hay mulch. Black plastic sheets had little, if any, effect on soil temperature.

In the Connecticut studies, clear plastic permitted weed growth that was mentioned as an objectional feature. In limited trials with clear plastic under apple trees in Massachusetts, it was found that the grass and broadleaf weeds were controlled during the summer months. During cool weather growth of grass and broadleaf weeds was stimulated. Whether the competition of the grass and broadleaf weeds during certain periods of the growing season is sufficient to have a detrimental effect on tree growth is not known.

Other questions pertaining to the use of small plastic sheets under apple trees remain to be answered. What is the effect of plastic mulches on the rooting habit of apple trees? Research with tobacco and other crops has shown that under plastic mulch, root growth near the surface was appreciably greater but root extension at deeper levels was not affected.

What is the effect of plastic mulches on tree growth? Will the higher soil temperature under clear plastic have an effect on tree growth in comparison to black plastic or hay mulch?

Until more is known about plastic for mulching apple trees, it is suggested that black plastic may be tried under newly planted trees if insufficient hay mulch is available to suppress grass and broadleaf weed growth. After the trees have been established more than a year in the orchard, the grower has the choice between black plastic, hay mulch or herbicides to control grass and broadleaf weeds. When hay mulch is available, it remains the number one recommendation.

* * * * * * * *

POMOLOGICAL PARAGRAPH
Plastic for Mulching Under Apple Trees
William J. Lord

There is grower interest in the use of black plastic as a means of weed control under apple trees. Black plastic is now available in rolls of individually serrated squares with each square perforated to facilitate placement around the tree trunk.

How much of a problem mice will be under the black plastic is not known - reports have been conflicting in this regard. We are trying to at least obtain a partial answer to this question in a demonstration experiment comparing black plastic with hay mulch.

Placement cost will at least equal that of the material assuming that 36" x 36" squares are used. A report from New Jersey indicated that 3 men were able to place the plastic squares at the rate of thirty trees per hour. Two men placed the squares and a third man covered the edges with soil.

In our mulching demonstration, one man unrolled the plastic and ripped off the squares. One man ripped the serration in the middle of the square and placed the plastic around the tree. A third man followed and pinned the 4 corners of each square into the soil by placing the point of a shovel on the plastic and thrusting it into the soil. Gravel which was hauled into the orchard was then placed on the edges of the plastic. Not taking into account the time necessary to get the gravel, 3 men were able to place 40 plastic

squares in 52 minutes.

Various other methods of laying the plastic are being tried by growers. One grower placed hay over the plastic. In another instance, short pieces of wire were bent U-shape and thrust through the plastic to keep it in place.

* * * * * * * *

FACTORS AFFECTING NUTRIENT CONTENT OF APPLE FOLIAGE

W.D. Weeks
Department of Horticultural Science

Crop size can have a considerable effect on the quantity of several elements in apple foliage. Leaves from a tree with a large crop will contain more nitrogen and less potassium than leaves from a tree with a light crop. Leaves from a light crop tree may have a leaf nitrogen which is .2 and .3 per cent lower than the same tree when it has a full crop. Differences in leaf potassium as great as .4 per cent may occur between heavy and light crop years. Calcium follows the same trend as nitrogen and exhibits about the same difference as nitrogen in leaf content between the light and heavy crop year. Leaf magnesium is slightly higher in a heavy crop than in a light crop year. Crop size has little, if any, effect on leaf phosphorus.

The relative amount of one element in relation to another may effect the mineral content of the leaf. For example, leaves which are relatively high in nitrogen tend to have lower levels of potassium and phosphorus and higher levels of magnesium and calcium than leaves from trees which have a low to medium level of nitrogen. High levels of potassium may depress leaf magnesium and calcium, particularly if the soil supply of magnesium and calcium are low. However, moderate levels of potassium do not seriously depress magnesium where there is an adequate supply of magnesium.

Another factor which may influence the leaf content of some elements is soil moisture or rainfall. Leaf potassium is generally lower in dry growing seasons than in years with adequate soil moisture. Magnesium is generally lower in years which have above normal rainfall during the early part of the growing season. The magnitude of the change in leaf content caused by seasonal rainfall will depend upon the wetness or dryness of the season and the supply of nutrients in the soil. Soil moisture extremes, either wet or dry, which prevent the development of new roots could conceivably reduce the leaf content of essential elements.

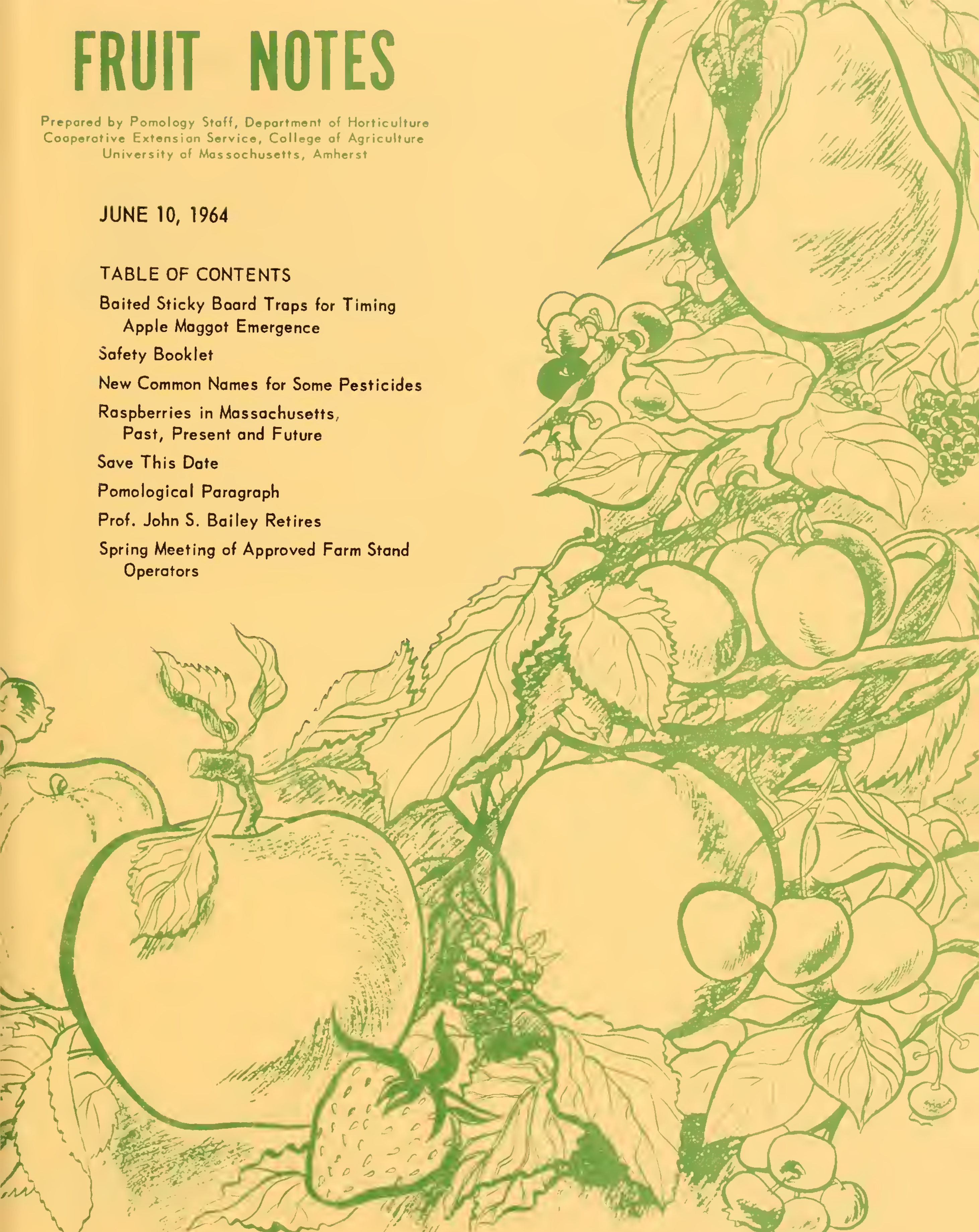
* * * * * * * *

FRUIT NOTES

Prepared by Pomology Staff, Department of Horticulture
Cooperative Extension Service, College of Agriculture
University of Massachusetts, Amherst

JUNE 10, 1964

TABLE OF CONTENTS



Issued by the Cooperative Extension Service, A. A. Spielman, Dean and Director, in furtherance of the Acts of May 8 and June 30, 1914; University of Massachusetts, United States Department of Agriculture and County Extension Services cooperating.
Publication Approved by Alfred C. Holland, State Purchasing Agent, No. 44.

BAITED STICKY BOARD TRAPS FOR TIMING APPLE MAGGOT EMERGENCE

H. E. Wave
Department of Entomology
and Plant Pathology

A baited sticky board trap suitable for use in determing apple maggot fly emergence has been described by George Still in the January-February, 1964, Ohio Farm and Home Research. Twenty-eight percent ammonia* was used as the attractant. Ordinary household ammonia (4%) can be used also but this only lasts for a day and has to be replaced every day. The stronger ammonia lasts 3-4 days without losing its attractancy.

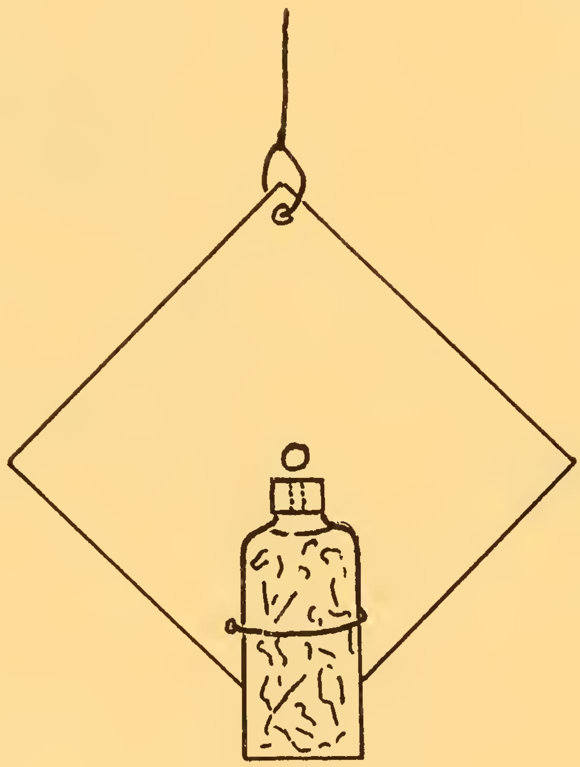


Figure 1. Sticky board trap with bait container in place.

The trap is made of 1/8-inch masonite 6 x 6 inches square. A 3/8-inch diameter hole is located in the center of the square to allow the ammonia vapors to attract flies on the opposite side of the panel. Both sides of the panel are painted with 2 coats of yellow enamel. The paint gives the panel a light background for observing trapped flies and also provides a smooth surface for applying the sticky material.

The author of the article states that 2 brands of sticky compounds are satisfactory for use on the panels. One, "Stickem", is obtainable in 1-pound containers from local nurseries, hardware stores, or from the supplier, Michel & Pelton Co., Oakland, California. The other "Bird Tanglefoot", is available in 1/10 gallon tubes which fit caulking guns. If a local supplier cannot furnish them, they may be obtained from the Tanglefoot Co., Grand Rapids, Michigan.

The sticky material is applied to both surfaces of the panel with a putty knife, preferably one with coarse serrations. The panel may be cleaned of debris and dead insects whenever necessary by scraping with a smooth blade and washing with xylene or kerosene.

The ammonia is placed in a 2-ounce prescription bottle, obtainable at drug stores. The bottle is lightly stuffed with absorbent cotton and wired to the panel so that the cap is just below the hole drilled in the center of the square (fig. 1). A 1/4-inch hole is bored through the plastic top of the bottle to allow the ammonia fumes to escape from the saturated cotton.

Traps should be placed well up in trees and within the foliage if possible. Foliage and limbs close enough to the traps to cause rubbing or sticking in high winds should be removed. The sticky board can be hung in the tree by attaching wire or string to a hole bored in one corner and pulling it over a limb or by climbing into the tree to attach it.

To record the earliest apple maggot emergence, traps should be put in operation by the middle of June in Massachusetts. Depending on weather, the earliest emergence varies from mid-June to early July.

After counting, the trapped flies should be removed with the point of a jackknife blade or some other sharp-pointed instrument to prevent counting the flies again later.

*Twenty-eight percent ammonia is considered a poison and purchasers are required to sign for it at drug stores.

****

SAFETY BOOKLET

John F. W. Schulze
Rural Civil Defense Specialist

How experienced is your farm help? How much new help must you hire each year? Do you depend on teenagers to complete your harvesting crew?

Should your answer to the last question be "yes", there is a safety booklet for young farm workers available to you in limited numbers. The publication has been prepared by the U. S. Department of Labor and contains nine pages of suggestions that will help to minimize accidents and injuries.

It is suggested that each young worker be given a copy of the booklet to read and keep as a guide in continuing safe work practices. Perhaps you would like a copy for yourself to use as a reference in instructing your adult workers.

For your supply of this useful booklet, write to: Mr. John F.W. Schulze, Chairman, Farm and Home Safety Program Committee, 211 Stockbridge Hall, University of Massachusetts, Amherst, Mass. (01003)

****

NEW COMMON NAMES FOR SOME PESTICIDES

H. E. Wave
C. J. Gilgut

Recently, several pesticides used on fruit were given new common names. To keep you abreast of these changes, the following list of accepted common names together with their trade names is provided. Some of the names in the list are not new but were added to make the list complete.

Common Name	Trade Name
binapacryl	Morocide
carbaryl	Sevin
carbophenothion	Trithion
demeton	Systox
dioxathion	Delnav
endosulfan	Thiodan
mevinphos	Phosdrin
phosphamidon	Dimecron
tetradifon	Tedion
captan	Captan 50 W, Orthocide
dichlone	Phygon XL
dodine	Cyprex
ferbam	Fermate, Carbamate, Cromate, Karbam Black, etc.
folpet	Phaltan
glyodin	Crag Fungicide
karathane	Karathane
thiram	Thylate

****

RASPBERRIES IN MASSACHUSETTS
PAST, PRESENT AND FUTURE

John S. Bailey
Department of Horticultural
Science

A dish of raspberries with a little sugar and cream is a delight to the palate whether you are a gourmet or not. Why are raspberries not in larger supply in our markets? Is there any likelihood of their becoming more plentiful? Let's take a look at the history of raspberry growing in Massachusetts first, then sum up the present, and look in our crystal ball to see what the future holds.

In the late teens and early twenties, there was enough of a raspberry industry so that Massachusetts berries were going to market in considerable quantities. According to the census of Agriculture, in 1920 there were 481 acres of raspberries in the state from which 934,656 pints were marketed. This industry was based mostly on the variety Cuthbert, which is a high quality variety still grown to a very limited extent in very favorable situations. It has two serious weaknesses. It is very susceptible to virus and to cold injury. It was principally virus infection, especially the mosaic type, which ruined most fields of Cuthbert. By the late twenties, the raspberry industry in the state was definitely on the decline. Growers, those who had the courage to stick with raspberry growing, were looking for a variety to replace Cuthbert. Many varieties have been tried and are still under trial, because the ideal variety has not been found.

At present, most commercial growers depend on the variety Latham. It was originated in Minnesota and selected because of its outstanding cold resistance. It also is slightly more virus tolerant than most other varieties. Unfortunately, it is very susceptible to spur blight, a fungus disease for which there is no satisfactory control. The fungus of spur blight often develops near the base of a cane, girdling and killing it during the winter so that the injury looks like winter killing. Winter injury, virus and other diseases are not the only problems of the industry.

Picking raspberries is a slow and often disagreeable job. As the economy went into an upward trend, pickers became more difficult to obtain and they demanded higher wages, thus increasing the cost of production. Also, raspberries are a very perishable fruit. A little moisture in the container and the berries mold and break down in a few hours. The result is a messy, unsaleable product.

All these troubles have harassed the industry to the point where many growers have stopped growing raspberries. In 1960, the few who still persisted had 68 acres which produced 78,768 pints, about 8.5% of the 1920 crop. Thus, it is obvious that raspberry growing is at a very low ebb in the state. Most of the plantings are small, an acre or less. The demand for raspberries is still good but has to be satisfied mostly by frozen fruit or fruit shipped in from other states.

Predicting the future of raspberry growing in Massachusetts is about as certain as predicting the weather years in advance. However, there are some practices, some results of research and some trends that point to a better future for the raspberry grower in Massachusetts.

First is the control of virus troubles. For several years, Dr. R. H. Converse of the U. S. Dept. of Agriculture has been working on the raspberry virus problem. By persistent search and special methods, he has collect 28 varieties of red raspberries free of virus. At present, only a small supply of a few of these varieties has been distributed to nurseries for multiplication and distribution. Very few growers will be able to get these superior stocks in 1964, but in a year or two after the supply has been built up in nurseries, plants of most desirable varieties should be available. The problem of keeping these superior stocks virus free in commercial plantings has not been solved, but the grower will be able to start a planting with far better plants than have been available for a long time.

The problem of cold injury will not be solved but may be somewhat alleviated by the use of virus free plants. The cold resistance of virus free compared with virus infected plants will have to be determined by research, but one would expect healthy plants to stand more cold than sick ones.

The use of chemical weed control is a promising method for reducing the requirements for labor and thus the cost of production. Spec. Cir. 215 of the Massachusetts Agr. Extension service gives the details for the chemical weeding of raspberries.

With the increase in the overall prosperity of the country, the problem of obtaining pickers becomes increasingly difficult. Some of the Massachusetts growers have solved this by adopting the "pick-your-own" system of marketing. This system not only eliminates the necessity for obtaining pickers, but it solves one of the worst marketing problems, getting the fruit into the hands of the consumer in good condition.

There is a development which gives promise of assisting in getting raspberries to market in good condition. A chemical, dihydroacetic acid, has been used to retard the growth of molds on berries. It does not eliminate mold but slows its growth so that the fruit has a much better chance of reaching the consumer in good condition. This chemical could be helpful where berries are marketed at a roadside stand.

It is very unlikely that any sizeable raspberry industry will develop again in Massachusetts. However, for the grower who has a favorable location near even one of the smaller centers of population, the prospects for successfully handling an acre or so of red raspberries is brighter.

SAVE THIS DATE

The annual summer meeting of the Massachusetts Fruit Growers' Association in cooperation with the Cooperative Extension Service, College of Agriculture, University of Massachusetts, will be held at the Horticultural Research Center at Belchertown, on July 15.

One of the projects at the Research Center has been top working some Baldwin trees to Red Delicious in order to have sufficient fruit of this variety for storage studies. Walter Weeks and George Olanyk are shown doing the top working.

****

POMOLOGICAL PARAGRAPH

Mechanical Harvesting of Strawberries

In a talk presented at the 68th annual meeting of the Virginia State Horticultural Society, David Friday of the Friday Tractor Company, Hartford, Michigan, stated that they have been working on the mechanical harvesting of strawberries for ten years and have made little or no progress. David Friday was of the opinion that--

"It will take a new variety that has all of its berries ripe at one time, and the fruit tough enough so that the patch can be combined all at once.

We had one of Dr. Scott's experimental seedlings (USDA) out of thousands on our farm last year that had 60 per cent of its berries ready to pick at one time, but this is not enough. This means that in 10 years, if you want strawberries to eat, you will have to pick them yourself. Unless there is a breakthrough in mechanical harvesting, some of these high harvest labor crops will be mainly grown around large population centers and offered in pick-yourself patches. This trend is already in progress around Chicago, Cleveland and Detroit."

Editor's Note - The "pick your own" method of harvesting strawberries has kept a number of Massachusetts growers in business during the last several years. With the introduction of virus free raspberry plants and better weed control materials, growers may find the growing of this crop profitable if they are sold by this method also.

****

POMOLOGICAL PARAGRAPH

Northwest Fruit Industry

At the 68th Annual Meeting of the Virginia State Horticultural Society, Dr. L. P. Batjer, U.S.D.A., Wenatchee, Washington, stated "the newest development in the Northwest fruit industry is the realization that we have too many apple trees". A tree census conducted in 1961 revealed that Washington has 5.1 million apple trees which represents a 66 per cent increase over the number of trees in 1949. Of these, 71 per cent of the Red Delicious trees and 87 per cent of the Golden Delicious trees are under 10 years old.

The average apple crop in Washington for the past ten years was 21 million boxes. Batjer estimates that within 5 to 10 years an average crop will be 34 million boxes, a 65 per cent increase.

-- William J. Lord

****

PROF. JOHN S. BAILEY RETIRES

Professor John S. Bailey, Associate Professor of Research, Department of Horticultural Science, retires on June 30, after 41 years of service to the University and the fruit growers.

Born in East Aurora, New York, he was raised in Lakewood, Ohio. He received his B.S. in 1922 from Michigan State College and an M.S. from Iowas State College in 1923. Prof. Bailey did further graduate study at Cornell University from 1926-1927.

Prof. Bailey joined the staff of the Massachusetts Agricultural College at Amherst in 1923 as an Investigator in Pomology. He was advanced to Assistant Professor in 1926 and to Associate Professor in 1952.

Between the years of 1952 and 1958, he was headquartered at the Cranberry Field Station at Wareham, Massachusetts, where he conducted research on strawberries, blueberries and beach plums. During the summer of 1957, he took a 6 months sabbatical and made a special study of small fruit growing on the west coast from Southern California to British Columbia, Canada.

His intensive study of the inheritance of certain fruit and foliage characters in peach trees from 1924 to 1949 led to the start of a chromosome map for peaches. Later he became well known for his research with small fruit. He has published research on the propagation, nutrition and pruning of cultivated blueberries, and winter hardiness of raspberries. His research results were instrumental in obtaining grower acceptance of virus-free strawberry plants, soil fumigation for strawberries and chemical weed control in small fruits. Prof. Bailey has published over 50 papers in technical journals and Extension Service Publications.

He holds membership in the American Society for Horticultural Science, Alpha Zeta and Sigma Xi.

****

SPRING MEETING OF APPROVED FARM STAND OPERATORS

Fred E. Cole
Inspector, Approved Farm Stand Program

The annual spring meeting of the Approved Farm Stand Program members was held on May 20th, at the Red Apple Farm in Phillipston, at which time there was a free exchange of ideas and discussion of selling at farm stands. The following are notes from general discussion.

Red Apple Farm wipes all apples. Considered it a sales advantage. The wiping of apples is gaining in practice.

Box liners of film are in use for Golden Delicious, Russets and pears. The extra weight at packing time pays for the film bag.

There was a reported tendency to shift from 8 qt. packages to 4 qt. packages on some stands.

The question of weight rather than measure for retail packages was discussed at length. Conclusions seemed to be to stay with measure for several important reasons from standpoint of roadside sales.

The advantage of choice of variety, size of packs and size and grade of apples on Approved Farm Stands was considered a substantial sales advantage.

Jams and jellies are moving OK. There seemed to be some items which moved faster than others and orders are being trimmed accordingly. Fruit syrups - Blackberry, Blueberry, Strawberry - are "taking hold". Maple products and honey are continuing popular.

Apple sectioner is a good item. There is need for a good apple corer.

Mrs. Cheney explained the use of the recipe of "Open-faced McIntosh Sandwich" on radio and TV.

The annual debate as to whether radio or newspaper ads were most helpful was carried on with newspapers getting the edge. Local differences were apparent.

Product Liability Insurance was considered a necessity by some operators.

There was some discussion regarding the proposed shortening of the "CA" storage period with the concensus of opinion in favor of maintaining present requirements and not for taking the risk of losing present advantages.

A motion was made by Charles Dowse, of Sherbon, seconded by Walker Cheney of Brimfield, and voted unanimously as follows:

> "All drops shall be marked as to grade or marked "Unclassified" but the term 'drops" may be used with the name of the variety in addition to the above requirement'. A typical mark for drops might be 'McIntosh Drops, U.S. Utility'. The grade designation provides a minimum standard for apples in the pack.

The group discussed the desirability of any change in the rules and regulations of the Approved Farm Stand Program and made no changes other than the one above regarding the use of the term "drops". The existing rules were working satisfactorily and profitably.

****

All pesticide chemicals mentioned in this publication are registered and cleared for the suggested uses in accordance with federal laws and regulations. Chapter 727, Acts of 1960, Commonwealth of Massachusetts requires that all pesticides sold in Massachusetts be registered with the Massachusetts Department of Public Health. Trade names, where used for clearness, do not indicate endorsement nor imply that similar products are not satisfactory.

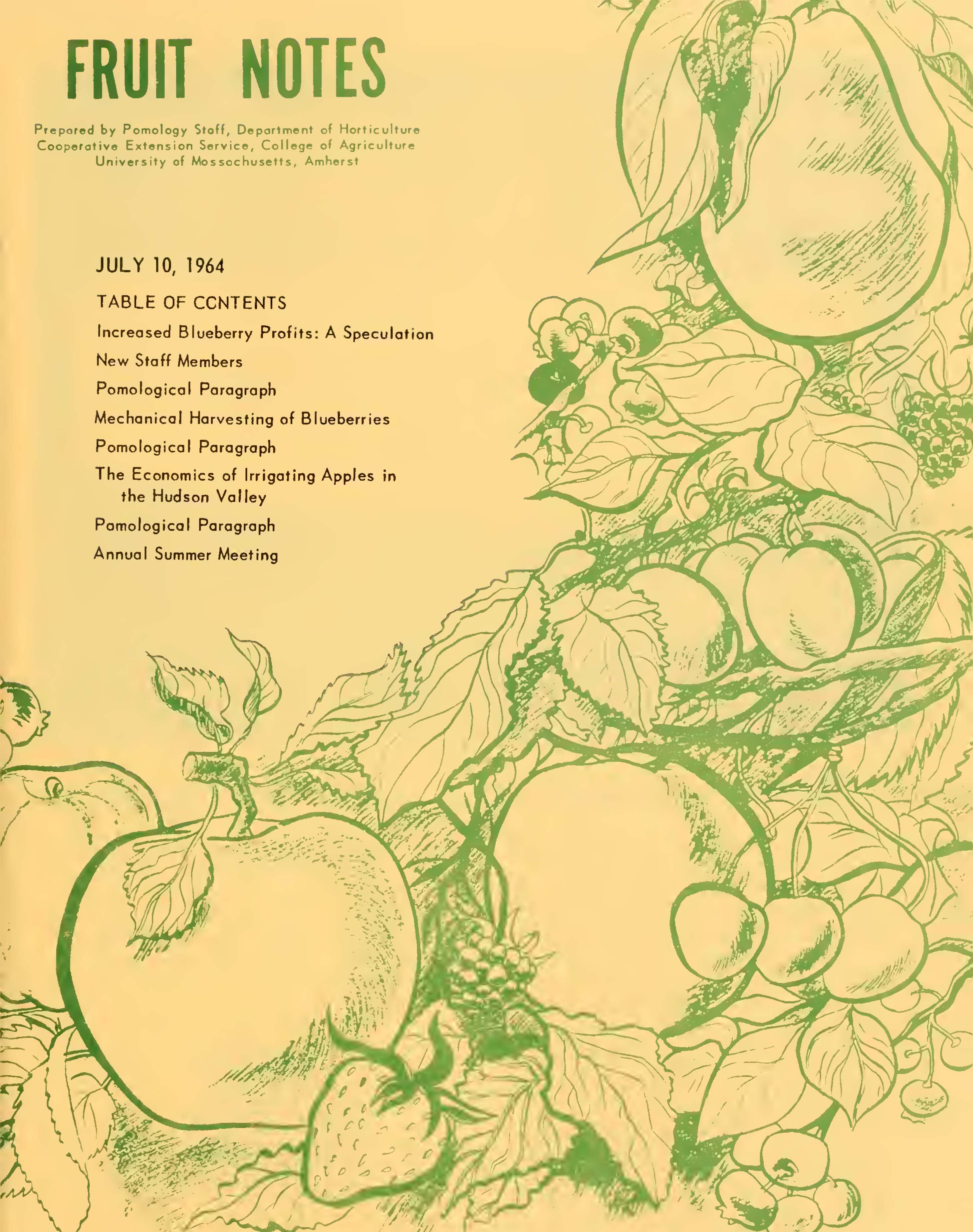
WARNING! MOST PESTICIDES ARE POISONOUS. READ AND FOLLOW ALL DIRECTIONS AND SAFETY PRECAUTIONS ON LABELS. HANDLE CAREFULLY AND STORE OUT OF REACH OF CHILDREN, PETS AND LIVESTOCK.

FRUIT NOTES

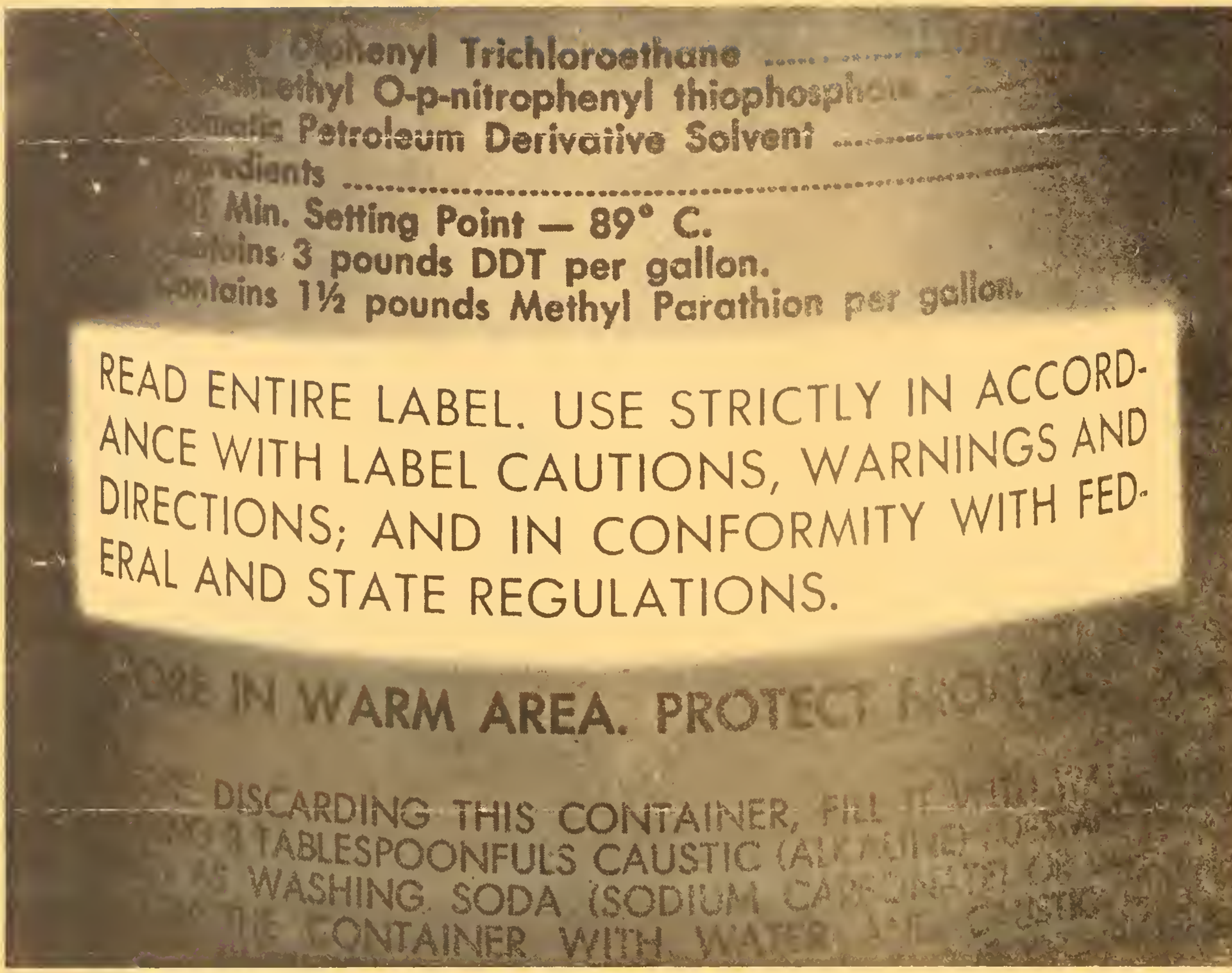
Prepared by Pomology Staff, Department of Horticulture
Cooperative Extension Service, College of Agriculture
University of Massachusetts, Amherst

JULY 10, 1964

TABLE OF CONTENTS



Issued by the Cooperative Extension Service, A. A. Spielman, Dean and Director, in furtherance of the Acts of May 8 and June 30, 1914; University of Massachusetts, United States Department of Agriculture and County Extension Services cooperating.
Publication Approved by Alfred C. Holland, State Purchasing Agent, No. 44.



The most important 21 words in pest control

You see those 21 words—or words like them – on every pesticide container you buy. They're the whole key to pesticide performance.

It takes thousands of hours of testing to come up with label directions. Laboratory and field tests conducted by professional chemists and agricultural scientists. Tests that have to meet the most stringent standards of government agencies.

But the important thing is what happens when you use the product. Those thousands of hours of tests behind the label directions have but one purpose: to help you get the safest, most effective and economical pest control possible. And following those directions is the only way to make sure you're getting it. That's why it's so important to read and understand the label before using any chemical product.

CO-OPERATION · FAIRNESS · INTEGRITY · N.A.C. ASSOCIATION

NATIONAL AGRICULTURAL CHEMICALS ASSOCIATION
1145 Nineteenth Street, N.W. Washington 6, D.C.

INCREASED BLUEBERRY PROFITS: A SPECULATION

J. S. Bailey
Department of Plant and Soil Sciences

With some people, speculation is a popular pastime. Like most speculators, we shall not be any richer, but we may be wiser.

Birds like blueberries. In fact, the birds like them so well that getting the berries first has become a serious grower problem. If he picks early, he sacrifices both quality and quantity. If he waits, the bushes must be covered with some kind of netting or a large part of the crop will be lost. Covering the bushes is very expensive. Can this cost be recovered?

Let's look at some figures and do some figuring. In 1957, Dr. Shutak and his associates published some interesting figures on blueberry development. They tagged berries and measured the volume when they turned blue and again after 3and 6 days. Here are their figures:

Increase in Volume after Development of Blue Coloration of Highbush Blueberries

Variety	No. of Days from Blue	Volume Increase (cu. mm)	Percent Volume Increase	Quarts Increase per 1000 Qts.
Bluecrop	3	280.3	18.3	183
Bluecrop	6	580.0	38.2	382
Ivanhoe	3	266.3	18.4	184
Ivanhoe	6	464.2	29.6	296
Earliblue	3	276.1	26.3	263
Pemberton	3	292.4	18.5	185
Dixi	3	578.5	11.1	111

Now, let's do the figuring. Leaving the Bluecrop berries on the bushes 3 days after they turned blue increased the crop by 183 quarts for every 1000 quarts picked. If your yield is about average, 3000 quarts per acre, the increase from delayed picking is 3 x 183=549 quarts or 1098 pints. At 3 pints for a dollar, the added income amounts to $366. If picking is delayed 6 days, the increased return is even more startling - $764 per acre.

Now, how much are you losing, if the bushes are not covered? Let's assume the birds get 25 per cent of the crop, a conservative figure in some cases. Then the birds get 750 of those 3000 quarts or 1500 pints. At 3 pints for a dollar, that's $500.

So you cover the bushes:

Saved 1500 pints @ 3 for $1	$ 500
Leaving the berries 6 days to size up	764
TOTAL Savings to OFFSET Netting Cost	$ 1264

Fantastic? Probably! Even if you cut that figure in half, it would go quite a way toward paying for covering the bushes with netting.

* * * * * * * *

NEW STAFF MEMBERS
Franklin W. Southwick
Head, Department of Plant and Soil Sciences

During the winter and spring we actively searched for well trained young men to fill positions which became available in the Department of Horticultural Science through retirement of former staff members. Three positions were available and all of these have now been filled. A brief description of the training and interests of the men who have accepted these positions follows.

Dr. Allen V. Barker - Dr. Barker was born and attended high school in McLeansboro, Illinois. He did his undergraduate work at the University of Illinois in Agricultural Science and graduated with high honors in 1958.

He continued his studies at Cornell University where he majored in soil science and minored in plant physiology and biochemistry and obtained his M.S. and Ph.D. degrees in 1959 and 1962, respectively. His thesis work, under the direction of Dr. Richard Bradfield, was concerned with the influence of potassium and nitrogen on the growth and composition of corn plants.

In 1962 Dr. Barker was appointed a Post-Doctoral Fellow at North Carolina State College in the Department of Soils, where he has been working with Drs. W. A. Jackson and R. J. Volk on plant physiological problems. His most recent work is related to the effects of NH_4 on photosynthesis, respiration and growth of plants.

Dr. Barker's background in soil science plus his interest in plant nutrition and other physiological problems should make him a very valuable addition to the new Plant and Soil Sciences Department (combined Horticultural Science and Agronomy Departments) being established July 1, 1964. He joins our staff on July 1, 1964.

Dr. William J. Bramlage - Dr. Bramlage is a native of Ohio and went to high school in Dayton. He graduated with honors from Ohio State University in 1959. At Ohio State he majored in Horticulture with a major interest in tree fruits.

Dr. Bramlage continued his studies at the University of Maryland under the direction of Dr. Arthur Thompson. His thesis work at Maryland was related to the influence of early-season boron sprays on fruit color, finish, maturity and storage life of apples and on carbohydrate changes and enzyme activity in the fruits. This work has recently been published in Maryland Agricultural Station Bulletin A-129, 1963. Dr. Bramlage majored in Horticulture at Maryland and minored in plant physiology, biometrics and biochemistry and received his M.S. and Ph.D. degrees in 1961 and 1963 respectively.

Following receipt of his Ph.D., Dr. Bramlage has been employed at the U.S. Horticultural Field Station, Agricultural Marketing Service, U.S. Department of Agriculture, Fresno, California. At Fresno, Dr. Bramlage has been concerned with the evaluation of gamma radiation as a means of reducing losses of fruits and vegetables during storage and marketing.

We anticipate that Dr. Bramlage will make significant contributions to our teaching and research programs in the area of post-harvest physiology of economic crops. He joins our staff July 1, 1964.

Dr. H. V. Marsh, Jr. - Dr. Marsh was brought up in the local Connecticut Valley area, and obtained his precollege education at Deerfield Academy. At the University of Massachusetts he was a chemistry major and graduated with a B.S. degree in 1954. After a period in the Armed Services, he continued his education at the University of Massachusetts in horticulture with a minor in botany and obtained his M.S. degree in 1958. His M.S. degree work provided substantial evidence that seed abortion was not a necessity nor the basic mechanism causing young apple abscission following an application of NAA (naphthalene acetic acid) shortly after petal-fall.

He continued his graduate work at North Carolina State in plant physiology and biochemistry under Dr. Harold Evans (now at Oregon State University). His work at North Carolina State involved an investigation of the role of iron in chlorophyll metabolism. Dr. Marsh received his Ph.D. in 1961 and then spent a summer at Brookhaven National Laboratory at Upton, L.I., in the laboratory of Dr. Robert Smillie, where he studied an enzyme which functions in both photosynthesis and carbohydrate breakdown.

In the fall of 1961, he accepted a post-doctoral appointment in the Biochemistry Department of Cornell University under Dr. Martin Gibbs. During a two-year period at Cornell he worked with a group attempting to establish definitive evidence as to whether or not the citric acid cycle operates in plants. For the past year Dr. Marsh has been employed at the Research Laboratories of the United Fruit Company at Norwood, Mass.

Dr. Marsh has the training and interest to initiate basic research programs dealing with plant response. He has already indicated a desire to study the mechanisms involved in abscission of young apple fruits following application of growth regulators, such as NAA for apple thinning. He'll join our staff sometime in September, 1964.

* * * * * * * *

POMOLOGICAL PARAGRAPH

X-Disease - Cornell Extension Bulletin 1100 titled "X-Disease of Peach and Cherry Trees and Its Control" is a publication that should be of interest to peach growers. In addition to a discussion of X-Disease and its control, the publication contains some excellent photographs which aid in identifying chokecherry.

By sending 20 cents, a copy may be obtained from the Cooperative Extension Service, Cornell University, Ithaca, New York.

- - William J. Lord

* * * * * * * *

MECHANICAL HARVESTING OF BLUEBERRIES

William J. Lord
Department of Plant and Soil Sciences

The following is an article taken from Agricultural Research Volume 12, No. 8, February, 1964:

> "Some agricultural leaders predict that fruit crops not harvested mechanically will someday be of minor importance, grown only as specialty items.
>
> ARS and State agricultural engineers are working to prevent this from happening with blueberries. In cooperative research at Michigan State University, East Lansing, ARS engineers G. E. Monroe and J. H. Levin have developed an experimental machine that will harvest cultivated blueberries at less that 1 cent a pound for labor.
>
> Three men and a harvester that incorporates the principles of the experimental unit should be able to do the work of 120 men harvesting by hand. One man would drive the machine while two handle berries.
>
> The experimental unit consists of two rotating spindles, mounted vertically on a steel frame, that straddle a row of blueberry bushes. Each spindle has 160 vibrating 'fingers'.
>
> As the unit moves down a row, the spindles rotate like giant turnstiles, moving the vibrating fingers in and out of the bushes. Mature blueberries are shaken off the plants and caught in wooden boxes carried at the base of the machine.
>
> Blueberries ripen over a 4 to 6 week period and three harvests are usually necessary to get most of the fruit. Because of the extended harvest season, hand pickers usually make only one or two harvests, then move on to other crops. As a result, tons of fruit often go unharvested. The new harvester should eliminate this problem and thus enable growers to market a far larger crop of cultivated blueberries.
>
> Experience hand pickers, who earn about 8 cents a pound, harvest less than half an acre of blueberries in 8 hours. In contrast, the machine can harvest more than half an acre in only 1 hour.
>
> The development of the experimental machine is another step toward mechanization of fruit harvesting. In 1958, Levin and two other ARS engineers at Michigan, S. L. Hedden and H. P. Gaston, developed a hand-held, electrically operated vibrator and catching frame that cut the cost of harvesting blueberries to 3.5 cents a pound.
>
> Last summer, the hand-held equipment was used to harvest about 35 percent of Michigan's blueberry crop and 20 percent of the New Jersey crop. These two States produce about 70 percent of all U.S. cultivated blueberries."

* * * * * * * *

POMOLOGICAL PARAGRAPH

Hot Water Treatment of Peaches - Research conducted by personnel of the Agricultural Marketing Service indicates that hot water shows promise as a control of fruit and vegetable spoilage. Treatment in water at 130°F. for 2 to 3 minutes reduced decay of peaches to a small fraction of the amount present in untreated peaches.

- - William J. Lord

* * * * * * * *

THE ECONOMICS OF IRRIGATING APPLES IN THE HUDSON VALLEY

William J. Lord
Department of Plant and Soil Sciences

C. G. Forshey, New York State Agricultural Experiment Station, Hudson Valley Laboratory, Highland and B. A. Dominick, Jr., Department of Agricultural Economics, Ithaca, in the January-February issue of Farm Research presented their analysis of the Economics of Irrigating Apples in the Hudson Valley. The information presented was based on data obtained from an apple irrigation project conducted in the Hudson Valley since 1955.

The article is of particular interest since irrigation studies on apples was conducted in a Massachusetts orchard from 1956 to 1962, inclusive. In the Massachusetts investigation, the orchard was irrigated in 1957 and 1962, but a fruit growth response was obtained only in 1957. The orchard selected for the study was located on a soil with only 0.7 to 1.9 inch per foot moisture holding capacity. The majority of Massachusetts orchards are located on drumlins or drumloid hills with soils having an estimated available moisture holding capacity of more than 1.5 inches per foot of soil to a depth of 3 or 4 feet or more. Therefore, the value of irrigation of McIntosh orchards located on the better soils in Massachusetts is highly questionable. Irrigation may be of value only in years of limited rainfall in orchards on soils of low water holding capacity and/or where trees are shallow rooted.

Forsheys' and Dominicks' economic analysis of irrigating apples in the Hudson Valley is as follows:

"Both experimental evidence and practical experience have indicated that the success of irrigation of apples is dependent upon four factors:

Soil type - Apples will size surprisingly well on a good deep loam even during the driest years. It is the shallow and coarse textured soils that will be most responsive. For reasonable returns, appreciable acreage must be located on soils such as Hoosic gravelly loam or Cossayuna sandy or gravelly loam.

Equipment - To irrigate efficiently, the grower should have sufficient pipe to cover 2 to 3 acres, depending on the distance from water supply, and a pump to deliver a minimum of one-half inch per hour to this acreage. Less pipe or less power greatly increases the cost per acre inch and reduces the acreage that can be covered.

Water supply - If irrigation is to be undertaken seriously, there should be enough water to apply 12 inches to 30 acres, or more, in even the driest years. This requires 7.5 million gallons.

Varieties - The increase in yield that can be expected is not enough to support this expensive operation. Sales value of the fruit must also be increased. This requires more of a price differential between sizes than $2.00 apples will provide.

Assuming that all of the above conditions are satisfactorily met, the response to supplemental irrigation will then be dependent upon rainfall. That the practice might be highly profitable in very dry years like 1962 is generally conceded. The practical question that arises is, what happens to this profit when it is spread over the intervening years when irrigation is unnecessary or unprofitable?

In computing the cost of irrigation, interest and depreciation were charged on the basis of the average number of hours the equipment might be operated per year. Using the number of days during the growing season that soil moisture was below the critical level, and assuming that an alert grower would want to irrigate almost every day that such conditions prevailed, it appears that the equipment might be used more than 600 hours in years like 1957 and 1962, or it might not be needed at all, as was the case in 1956, 1959, and 1960. But the annual average for the 9 years 1955 - 1963 was approximately 200 hours.

The response of Delicious apples to irrigation in 1962 is presented in Table 1.

Table 1. - The Effect of Irrigation on Size and Yield of Delicious Apples - 1962

	Fruit size - percent of total			
Treatment	Less than $2\frac{1}{2}$ in.	$2\frac{1}{2}$ - 3 in.	3 in. and up	Yield - field boxes per tree
Unirrigated	33.4	66.6	0	16.1
Irrigated	17.8	76.9	5.3	18.3

The response to irrigation obtained with Delicious in 1962 showed a net return per acre of $162. The added income was derived from two sources; more bushels of apples and larger-sized apples. After allowing for utilities and wastage, the volume of apples harvested and sold from the irrigated orchard increased 14 percent compared with the unirrigated block. Irrigation resulted in 40 per-

cent more bushels of apples of size 2½ inches and larger and 40 percent fewer bushels of apples smaller than 2½ inches in diameter. This increase in size of individual apples as well as the added number of bushels contributed to the increased net returns. This is typical of response to irrigation in this area. Increases in number of bushels picked are usually rather modest. Increased returns will be realized only if the variety irrigated is one with a substantial price differential between sizes.

During the period under study (1955 - 1963), irrigation of apples was profitable in the Hudson Valley only during 1962 and 1957. The net return from irrigating Golden Delicious in 1957 was $157 per acre. Therefore, the total return for the past 9 years would amount to $319 per acre. However, if optimum soil moisture conditions had been maintained throughout each of these growing seasons, it would have been necessary to apply some water in 1955, 1958, 1961, and 1963. This would have required a total of 21 inches. These unproductive efforts add $125 to the costs and reduce the net return to $194.

Interest and depreciation amount to $900 per year. The average net return for the two profitable years was $160 per acre. Assuming that the previously mentioned conditions of soil, equipment, water supply, and variety are satisfied, irrigation equipment would pay for itself if the response in the order of that in 1957 and 1962 could be obtained on about 35 acres or more as frequently as once in 5 years. Added net returns would be possible with a more favorable response such as more bushels of apples, greater size changes, larger price premiums between sizes or by irrigating, more acres of bearing apples."

* * * * * * * *

POMOLOGICAL PARAGRAPH

<u>Reducing Load of Fruit on the Leader of Trees on Size Controlling Stock</u> - Growers should avoid allowing too many fruit to develop on the leader of trees on size controlling rootstocks. In fact, in some areas it is recommended that fruit should be removed from the trees until the fourth year. Then for the succeeding year or two, depending upon tree size, the removal of fruit from the leader should be continued.

* * * * * * * *

ANNUAL SUMMER MEETING
of the
MASSACHUSETTS FRUIT GROWERS ASSOCIATION
in Cooperation with the
COLLEGE OF AGRICULTURE, UNIVERSITY OF MASSACHUSETTS

Horticultural Research Center, Univ. of Mass., Belchertown*
Wednesday July 15, 1964

- - - -

10:00 A.M. Tour of the Research Center plantings and its present facilities.

12:00 Noon Sandwiches, Coffee, Cold Drinks and Ice Cream will be served by the Women's Auxillary of the Belchertown American Legion, Post 239.

1:30 P.M. A Word of Welcome - M.F.G.A. President Charles A. Dowse, Jr.

1:35 P.M. Progress Report of the New England Apple Council - William Doe and William Hermann

1:50 P.M. The Fruit Grower and his Labor Problem - Philip Good, Executive Secretary-Treasurer, Massachusetts Farm Bureau Federation

2:30 P.M. Increasing Apple Harvest Efficiency - Dr. Howard A. Rollin, Jr. Horticulturist, V.P.I., Virginia

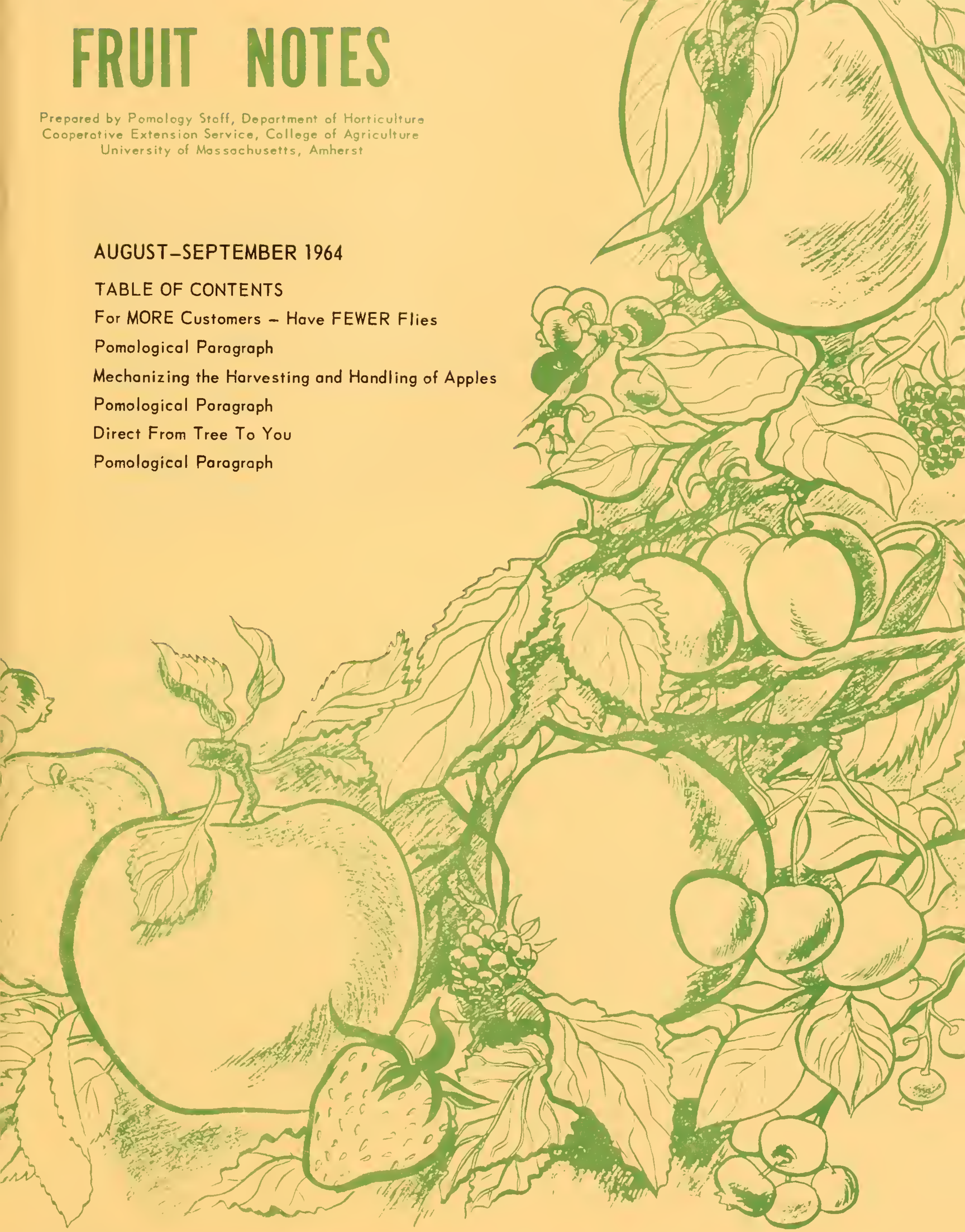
3:15 P.M. Crop Estimate for 1964 - Warren Clapp, Massachusetts Department of Agriculture

3:25 P.M. Insect Control Problems from Now until Harvest - Dr. Herbert Wave, University of Massachusetts

*Directions: - From Belchertown center, proceed on Route 181 about 2.5 miles toward Palmer, bear left on Mt. Sears Road (Cold Spring Road on some maps) 0.7 miles to Sabin Street, bear left to the Research Center. If approaching Belchertown from Palmer, take Route 181 from Route 20.

FRUIT NOTES

Prepared by Pomology Staff, Department of Horticulture
Cooperative Extension Service, College of Agriculture
University of Massachusetts, Amherst



AUGUST-SEPTEMBER 1964

TABLE OF CONTENTS

Issued by the Cooperative Extension Service, A. A. Spielman, Dean and Director, in furtherance of the Acts of May 8 and June 30, 1914, University of Massachusetts, United States Department of Agriculture and County Extension Services cooperating.
Publication Approved by Alfred C. Holland, State Purchasing Agent, No. 44.

PUBLICATIONS AVAILABLE

Available upon request through your County Extension Service or by writing to the mailing room, University of Massachusetts, are the following publications:

Special Circular No. 254 - Preharvest Drop Control of Apples

Special Circular No. 246 - Be A Better Apple Picker

Special Circular No. 246A - Be A Better Apple Picker (Spanish Translation)

Special Circular No. 277 - Scald Control for Apples

Extension Publication 422 - Proceedings of the New England - New York Controlled Atmosphere Storage Seminar

* * * * * * * *

All pesticide chemicals mentioned in this publication are registered and cleared for the suggested uses in accordance with federal laws and regulations. Chapter 727, Acts of 1960, Commonwealth of Massachusetts requires that all pesticides sold in Massachusetts be registered with the Massachusetts Department of Public Health. Trade names, where used for clearness, do not indicate endorsement nor imply that similar products are not satisfactory.

WARNING! MOST PESTICIDES ARE POISONOUS. READ AND FOLLOW ALL DIRECTIONS AND SAFETY PRECAUTIONS ON LABELS. HANDLE CAREFULLY AND STORE OUT OF REACH OF CHILDREN, PETS AND LIVESTOCK.

For MORE Customers - Have FEWER Flies

E. H. Wheeler
Department of Entomology and Plant Pathology

Flies do NOT attract customers, but many roadside and farm stands and cider pressed DO attract flies.

You, Mr. Owner or Operator, can DO SOMETHING ABOUT IT.

1. CLEAN UP and KEEP CLEAN!

   Flies are attracted to moisture - especially juices from fruits, vegetables, milk, eggs, and meats. Fruit pomace and any decaying fruit, vegetable or meat scraps are attractive to flies. Even small amounts, if moist, may be a breeding ground for more flies.

   Provide <u>tight</u> containers with <u>tight</u> covers such as galvanized cans for wastes. Stand them on a hard, easily cleaned surface. Empty waste containers and <u>clean them</u> every day. Bury or burn the wastes immediately - flies travel farther than you may think possible.

   Clean out and remove empty boxes, baskets, cartons, etc. Store them as far from the stand or mill as possible. A dump <u>out back</u> may be out of sight, but the flies it attracts and breeds will be <u>out front</u> in full view.

2. SCREENS are WORTHWHILE.

   Screen insects out wherever possible. For the tiny fruit flies it helps greatly to paint screening with an oil solution of 1% diazinon.

3. USE RESIDUAL INSECTICIDES ON SURFACES!

   Apply residual materials to <u>all</u> surfaces on which flies commonly rest in and around the stand or mill; include nearby fences, refuse areas, etc. AVOID <u>contamination of edible products and equipment</u>.

   Wettable powders leave a visible deposit; emulsifiable concentrates diluted with water do not; oil solutions are not diluted and leave no visible deposit.

   Emulsifiable liquid concentrates of ronnel (Korlan), dimethoate (Cygon) and diazinon are most suitable and effective for long lasting residual applications. Malathion and naled (Dibrom) remain effective for just a few days. Follow all directions on container labels for correct dilution and precautions in use.

4. BAITS SUPPLEMENT other MEASURES to control the HOUSE FLY.

Baits containing dichlorvos (DDVP), trichlorfon (Dipterex), diazinon or malathion are available under many brand names. Use them sparingly, but frequently, on all horizontal dry surfaces in or around the stand or mill where flies tend to gather. Bait sprays may be prepared and used according to directions on the labels of ronnel, dimethoate and diazinon.

5. SPACE TREATMENTS ESSENTIAL TOO!

Stands and cider mills that can be closed up completely or enough to prevent cross ventilation may be "space treated" with a finely atomized spray or aerosol. All flies then in the building should be killed by the treatment; there is no residual effect.

Apply space treatments at closing time and at other times as operations permit and the number of flies make it desirable. COVER FOOD and FOOD HANDLING EQUIPMENT.

Pyrethrin or allethrin, each synergized by materials like piperonyl butoxide, sulfoxide or others. are the chief killing agents. Some products contain methoxychlor or other materials. Extra care to prevent contamination of food or equipment must be used if insecticides other than pyrethrins or allethrin are included in the product.

Apply space treatments by using oil based pyrethrin or allethrin "fly sprays" in hand or electrically operated atomizers or by using aerosol "bombs". Large (5 lb.) bombs are less expensive than smaller types if used according to directions. Otherwise the smaller types may be just as convenient and no more costly.

Read the list of "active ingredients" to get what you want. Follow "directions for use" to do the best job safely.

Try resin strips containing 20% dichlorvos (DDVP,Vapona) if you can reduce ventilation at least part of the time. Determine the space and follow directions so as to obtain an effective concentration of vapor.

6. FANS HELP

Fans that direct a current of air across displays may help greatly to keep flies off those products especially attractive to them. "Curtains" of moving air currents directed across doorways from inside or above will reduce the number of flies which enter.

BUT

Without your complete attention to NO. 1, you cannot expect the suggestions under No.'s 2, 3, 4, and 5 to solve your fly problem.

* * * * * * * *

POMOLOGICAL PARAGRAPH

CA Storage Hazard - The June 18, 1963 issue of Produce News carried a story about two men that nearly lost their lives by wandering into a CA room. The storage manager stated that the room was well marked and the reasons for danger stated.

Let's prevent this happening in Massachusetts! Apparently signs will not do the job.

- - William J. Lord

* * * * * * * *

MECHANIZING THE HARVESTING AND HANDLING OF APPLES

William J. Lord
Department of Plant and Soil Sciences

Most efficiencies in apple production have been made in the growing, storage and selling operations. As a result, harvesting costs make up a large share of the total cost of raising apples. A study of 49 apple enterprises in Ulster County, New York, in 1962, showed that harvesting costs averaged approximately 45 cents per bushel where yields were about 350 bushels per acre. (Fruit-Farm Management Letter, No. 9, March 24, 1963 - B. F. Stanton and B. A. Dominick, Jr. , Department of Agricultural Economics, Cornell University)

Picking costs were approximately 40 per cent of the total cost of harvesting. Other harvest labor, including such jobs as distributing boxes prior to harvest, leveling boxes, hauling fruit to storage, and supervision of labor crews accounted for 30 per cent of the harvest costs. The other cost items were: harvest equipment - 2 per cent, housing labor - 5 per cent, truck and tractor - 6 per cent, and containers - 17 per cent.

Stantons' and Dominicks' studies show that approximately 70 per cent of the harvest cost is labor. The increasing difficulty of obtaining labor and the high cost when it is available is a problem of increasing magnitude in all agriculture.

Research on Mechanization of Fruit Harvest

Research on mechanizing the harvesting and handling of fruits has increased many fold the last 10 to 15 years. Today, studies are currently being conducted on the mechanical handling and harvesting of apples, peaches, apricots, prunes, dates, citrus, grapes, and blueberries.

A. R. S. Special Report, United States Department of Agriculture, 22-88 published in February, 1964 discusses the progress that research

is making to mechanize the harvesting and handling of fruits. A few of the examples cited in this publication are as follows: "During 1962, about 2 million pounds of sour cherries were harvested mechanically at a cost approximately ½ cent per pound against 3 cents per pound usually paid handpickers." "Compared to handpicking, mechanically harvesting Stanley Prune plums saves the grower about 23 cents per bushel." "One man can mechanically harvest as many blueberries as six handpickers and six men can harvest as many cherries as 33 handpickers."

Growers have constructed and tried apple picking aids of various types for many years: stilts, mobile ladders, and platforms, and hydraulic lifts, etc. The platforms and lifts are in use by some growers for pruning and thinning in addition to picking. Growers' use, however, has been limited because many of these devices have failed to perform the necessary functions satisfactorily and economically.

Use of Mobile Towers Studied in Virginia

Dr. Howard Rollins, Jr. reported on the use of mobile towers in Virginia during the fall of 1963 (Proceedings of the 68th Virginia State Horticultural Society). He is quoted directly as follows: "Two different types of mobile orchard towers were used in 1963 studies. One, referred to as the "wish basket", is manufactured by the Friday Tractor Company of Hartford, Michigan. It is a tractor drawn unit with hydraulic controls powered by a tractor-powered pump. The man in the basket is able to place himself anywhere in the tree that he might wish. The equipment is basically designed for pruning. To adapt it to harvesting, a two and a half bushel bucket was fitted to the front of the basket. The bucket contained a bladder which was gradually deflated allowing the fruit to settle slowly to the bottom of the container. A trailer carrying bulk bins was drawn behind the "wish basket", and the picker, upon filling the two and a half bushel basket, maneuvered himself to the bulk bin and released the fruit.

The second mobile tower included in the test was manufactured by the Edwards Equipment Company of Yakima, Washington, and is referred to as the "Dynasoar". It is a self-propelled mobile unit. The "Dynasoar" tower was fitted with a specially constructed conveyer system and automatic bulk bin filler by Dr. Cunningham and Mr. Pfost in order to provide a means of continually moving fruit from the picker.

In order to evaluate the potentials of the mobile orchard towers, a detailed comparison of the ability of a picker to harvest fruit using each of the two towers and a conventional ladder was made. A total of 135 trees were harvested during the course of the tests. Each of the three pickers harvested 15 trees with each of the three methods. Each step of the harvest operation was timed with a stop watch. Fruit samples were collected and later appraised for bruising.

A critical evaluation of the data revealed that under the conditions of this test the use of mobile orchard towers did not increase the efficiency of the pickers. In fact, their rate of picking was slow-

er with the mobile orchard towers than with conventional ladders. It is believed that with additional operator experience, better adopted orchard conditions, and refinements in the equipment, the efficiency of the picker could be improved. However, even with these improvements, it is doubtful that the equipment would be practical in the harvest operation.

The fruit picked with the "Dynasoar" showed less bruising and the fruit picked with the "wish basket" more bruising than fruit picked by conventional ladder methods. However, the differences were not sufficient to be major factors in the evaluation of this particular test.

On the basis of the 1963 results, there appears to be little promise in the use of mobile orchard towers to ease the harvest labor requirements. It also appears that future efforts should be concentrated in two principal areas: (1) modification of the tree to facilitate harvest either by hand or by machine, (2) development of mechanical fruit removal procedures.

Work will continue. The problem is a difficult one, but one that must be solved."

Mechanical Harvest of Baldwin Apples in Massachusetts

Mechanical harvesting of apples using an inertia shaker and collecting equipment has been tested in several states including our own. In 1961, Arthur Selders, graduate student; Department of Agricultural Engineering, University of Massachusetts initiated a study to develop and evaluate a system of harvesting and handling Baldwin apples from the tree to the processing plant by the use of mechanical equipment. The equipment consisted of a commercially manufactured tractor mounted tree shaker, a collector unit and power driven conveyor system, bulk boxes, a tractor fork lift and a truck. Apples were removed from the tree with the shaker, collected and conveyed into the bulk boxes which were then handled in the orchard and loaded onto the truck with the tractor fork lift for transporting to the processing plant.

Quality of the fruit was acceptable to the processor and the wastage factor was only slightly higher than for hand-picked fruit. However, severity of rot on mechanically harvested apples held in storage may be a problem.

Our Agricultural Economists calculate that a volume of approximately 6,000 bushels of apples harvested by this mechanical system is necessary before any savings can be realized. With a volume of 10,000 bushels, a grower could expect a savings of from $500 - $1000, depending upon harvesting rates obtained.

The utilization of machine-picked apples for processing looks promising. However, trees must be modified to facilitate equipment placement.

Will McIntosh Be Harvested Mechanically?

Whether or not mechanical harvesting of McIntosh will ever become a reality is not known. Growers have planted semi-dwarf and dwarf trees so that they will make a solid hedge row. Whether or not these trees can or will be hearvested mechanically is also a question. What the writer is quite certain of however is that an increasing number of growers are going to invite the public to "pick your own" fruit. It is a natural for orchards located near centers of population.

Until mechanical harvesting of McIntosh apples becomes a reality we must continue to strive for efficiency by making use of those aids for handpickers that fit our operations: self-propelled lifts, platforms, pick and drop equipment, pallets, bulk boxes, lift equipment, etc.

Modifying Trees to Facilitate Harvest Efficiency

Dr. Howard Rollins, Jr. at V. P. I. Blacksburg, Virginia, suggests, "If we cannot develop machinery to reduce labor requirements with conventional trees, we may be able to modify the tree to facilitate greater harvest efficiency. If a high density hedge row planting could be established with trees planted about six feet apart, in a row and trained to provide a "wall" of trees 5 feet thick and 10 to 14 feet high, harvest labor efficiency could be increased. Men riding at two levels on a low trailer moving slowly down the tree row could reach the center of such trees. They could pick either on to a conveyor or into conventional picking bags and consequently dump the fruit into a bulk bin also on the low trailer. With such a system, additional equipment costs would not likely exceed equipment savings. For example, no ladders and less bulk bin placement would be necessary.

With such a high density hedge row production system, a picker could harvest significatly more fruit during a given period of time, than is true in conventional plantings. In conventional orchards a good picker can harvest 100 bushels of apples a day and by receiving 15¢ a bushel, he receives a day's pay of $15. On the other hand, if he were able to pick 200 bushels of apples during the same period of time, still at the 15¢ per bushel rate, his day's wages would be doubled without increasing the per bushel cost to the grower. With such a pay incentive harvest help may become available that is not presently available. Energetic workers with full time employment elsewhere might wish to put in a week or two picking apples in lieu of a vacation or local workers may be willing to put in 6-8 hours additional work late in the afternoon and during the early evening hours to earn a little extra pay. Night harvesting could be effectively carried on through the use of flood lights in such hedge row plantings. It is also possible that since the work would be lightened, women could be more effectively used in the apple harvest operation.

Another factor to be kept in mind is that high density hedge row plantings would be better adapted to ultimate complete mechanization of the apple harvest operation. If fruit removal equipment is developed,

it is likely to be used more effectively in plantings where fruit is oriented along the relatively uniform plane that would exist in high density hedge row plantings. These plantings would also have the potential for other increases in production efficiency such as early production, higher yields per acre, more efficient use of pesticide chemicals, and more uniform fruit quality.

It is true that high density hedge row plantings are a great divergence from what we currently consider as conventional fruit production practices. However, the general approach is not new. Various sections of Europe have been forced into such systems, largely due to limitations in available land, a number of years ago. Up until recently there has been no need, in this country, to move in this direction; however the economics of fruit production has changed the picture and made such approaches more practical."

* * * * * * * *

POMOLOGICAL PARAGRAPH

Timing the Apple Picker - A time and motion study of apple picking was conducted by H. P. Gaston and J. H. Levin and reported in the quarterly Bulletin of the Michigan Agricultural Experiment Station, Volume 36, August, 1953. Their studies showed that approximately 40 per cent of the fruit was picked from the ground and 60 per cent from ladders. On the average, 73 per cent of the pickers' time was devoted to picking apples. Nineteen per cent of the pickers' time was spent moving fruit from tree to crate and returning to picking position. Three per cent of the pickers' time was devoted to moving ladders and 5 per cent resting, eating apples, smoking, etc.

- - William J. Lord

* * * * * * * *

DIRECT FROM TREE TO YOU

William J. Lord
Department of Plant and Soil Sciences

"Direct from tree to you" is a new method of harvesting and marketing apples currently being investigated by Anthony C. Cunningham, Department of Agricultural Economics, Cornell University, Ithaca, New York, and reported in the September - November, 1963 issue of Farm Research. Apples are picked directly into quarter-bushel cartons and the filled containers stacked on pallets or platforms so that they can be handled mechanically from the orchard to the supermarket. The pallets also serve as display racks in the stores.

A shoulder harness has been devised to hold 2 cartons into which the picker places the McIntosh apples. Since the fruit are sold as orchard run apples, no grading is attempted other than instructing pickers to avoid undersized, misshapen, or damaged apples.

Two years of testing in 16 supermarkets indicated that sales increased and that in-store labor requirements were reduced. Average weekly apple sales, during the 3-month test period, increased 45 per cent. The test period was of insufficient duration to determine the extent of repeat sales of apples in the quarter-bushel cartons, however.

EDITOR'S NOTE - Pallet handling of fruit from the orchard to the store is the basic feature of this apple marketing method. Also, the quarter-bushel cartons are attractive and easy to palletize. This approach is somewhat comparable to harvest time store delivery by some Massachusetts growers of orchard-run McIntosh in peach baskets. Under the Massachusetts Apple Grading Law, orchard-run fruit must be marked as "Unclassified". The term "Unclassified" is not a grade in itself, but is used to indicate that no grade has been used.

* * * * * * * *

POMOLOGICAL PARAGRAPH

Hand Packing From Bulk Boxes - The convenience of bulk boxes in the harvest and storage operation is well established. The investment in a water dumper, grading machine, and in many instances a new packing shed, has discouraged growers considering bulk boxes. A few growers are hand packing from bulk boxes and are satisfied with the operation as a means of taking advantage of the convenience of bulk boxes without involving a considerable financial investment in packing equipment. The writer is of the opinion more growers should consider hand packing from bulk boxes.

- - William J. Lord

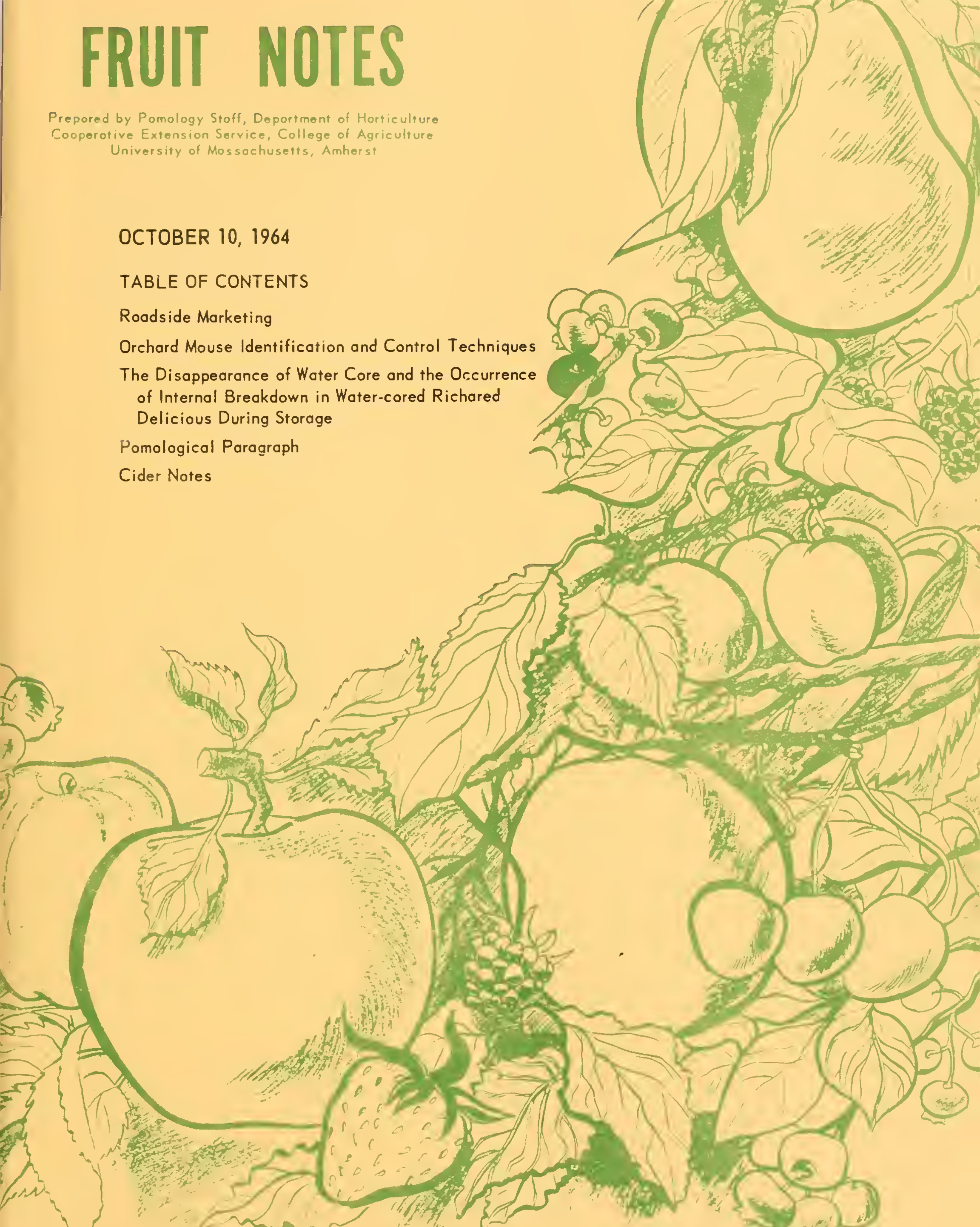
* * * * * * * *

FRUIT NOTES

Prepared by Pomology Staff, Department of Horticulture
Cooperative Extension Service, College of Agriculture
University of Massachusetts, Amherst

OCTOBER 10, 1964

TABLE OF CONTENTS



Issued by the Cooperative Extension Service, A. A. Spielman, Dean and Director, in furtherance of the Acts of May 8 and June 30, 1914, University of Massachusetts, United States Department of Agriculture and County Extension Services cooperating. Publication Approved by Alfred C. Holland, State Purchasing Agent, No. 44.

ROADSIDE MARKETING

William J. Lord
Deparment of Plant and Soil Sciences

The following excerpts were taken from an article in the Hoosier Horticulture Newsletter prepared by Jerome Hull, Jr., Extension Pomologist, Purdue University. It discussed some of the proceedings of the 4th annual Ohio Roadside Marketing Conference of November 22, 1963. I believe many readers will find the information about the Oak Glen marketing program, pick-your-own method of selling, the case study of the Lynd roadside market and the information on cider interesting and useful.

"The keynote speaker at the Roadside Marketing Conference was Mr. Wilson Parker from Yucaipa, California. He has developed an outstanding market at his orchard located about 30 miles east of Los Angeles. Mr. Parker's ranch is the largest of 14 ranches growing fruit in the Yucaipa-Oak Glen area. These orchardists retail nearly all their production (amounting to approximately $1,000,000 annually) directly to the consumer.

Mr. Parker reported the Oak Glen apple area is approximately 6 to 8 miles in length and elevated, rugged territory. It is an extremely scenic area and thus many potential customers combine a tour of this scenic area with a visit to the roadside fruit markets. Parker revealed they started in their marketing enterprise by exhibiting their fruit at fairs one year, winning $8,000 to $9,000 in one year which was then used to start the Oak Glen marketing program. Their promotion now attracts approximately 500,000 customers into this scenic area each year. Parker's market now attracts so many customers that he carries one half million dollars liability insurance and must fence much of his ranch to prevent customers from stealing fruit from the orchard. He also hires a detective to prevent shoplifting in the market.

The Oak Glen Association consists of 12 apple growers who hire a publicity man to write press releases about their scenic area and its local apple markets and distribute these to newspaper editors. Parker indicated their biggest break in advertising came from tie-in advertising with automobiles! Automobile editors, anxious for a fresh and different approach to introduce new car models, agreed to use apple harvest scenes for background and were very successful. This has also helped promote their area's scenery. Ford showed a 1/2 hour colored TV travelogue of the Oak Glen area. (You cannot buy this kind of promotion.) As a result of all this promotion, Oak Glen, considered a relatively wild area 15 years ago, is considered one of the most promising areas in the country today.

The scenic aspect of the area and the promotion by the fruit growers has tremendous appeal. Parker reports newspapers now write and request to be placed on the Association's mailing list to receive their press releases.

The Oak Glen Association finances itself through a 1½¢ per box assessment obtaining $3000 from the growers and $500 from three local restaurants also benefiting profitably by the many hungry people visiting the area. The Association spends its $3500 budget as follows:

$1,000	Salary of Publicity Director
500	Publicity Director's expenses
1,000	Fall picnic for food editors, travel editors, etc.
500	Buy apples for distribution to editors, etc.
500	Brochures and similar material

Parker revealed that the press party is held in the area about September 15. They invite all food editors of newspapers in southern California, travel editors, etc., and the extension personnel from the University of California involved in home economics. In other words, any person or editor involved in promoting food and travel.

Parker stated they really have no organization. It is kind of a loose association. In the past 17 years the fruit growers in the Oak Glen area have agreed on only four things: (1) a need for advertising for their area; (2) no signs to be erected in the area except on each individual's property (They do not desire to mar the scenic beauty of the area with many roadside signs.); (3) an agreement to pay 1½¢ per box assessment per year for Association fees; and (4) to bring in no outside apples for local marketing. He indicated that growers have never been able to agree upon prices and quality to be offered at their local markets.

Grower Experience with "Pick-Your-Own"

"An interesting feature of the conference was a discussion of pick-your-own direct selling. Robert MacQueen of Holland, Ohio, markets both apples and peaches by this method. He harvests 20 acres of peaches utilizing three men (one foreman and two men) and pick-your-own customers. Variety selection is very important for successful pick-your-own peach marketing. For example, he raises Early Red Fre, an early poor quality peach not adapted to pick-your-own marketing. It is not a canning variety and doesn't hold up very well. Consequently he begins his pick-your-own marketing with Redhaven. It takes two to three days for his customers to pick 250 Redhaven trees. He closes his orchard after each variety is picked and waits for the next variety to get ripe. He wants each variety to be fully ripe before opening the orchard to pick-your-own customers for that variety.

MacQueen has been charging the same price for his peaches each year since he started pick-your-own marketing ($2.75 per bushel). All he provides the customer is a ladder. If they desire, they can purchase baskets. He does not permit pick-your-own customers in the orchard for less than one bushel of fruit. If they desire less than one bushel, they can purchase it at his local sales shed. He advised having only one way into the orchard and only one way out.

MacQueen stressed pruning out trees and proper fruit thinning. He desires large perfect peaches and has had very favorable customer reaction. Customers use this opportunity for family events such as picnics, etc. plus the opportunity to obtain tree-ripe peaches. He gives his customers a sheet of instructions covering his pick-your-own policy, etc. Likewise he carries $200,000 liability insurance.

MacQueen opens his apple orchard to pick-your-own customers about October 10, after harvesting his Jonathan and Red Delicious. He has 25 acres of apples and charges $2.25 per bushel, the main varieties consisting of Rome, Baldwin, Wagner, and Winesap.

W. W. Magill, retired Kentucky Extension Horticulturist, related his experiences and success with pick-your-own peach marketing. He pointed out that customers will not break any more trees and branches than most hired pickers. He finds that most customers pay the same price for peaches either off the tree or the ground.

Ralph Folsom, Bellefontaine, Ohio grower, markets five acres of small fruits and 30 acres of orchard on a pick-your-own basis. He obtains 25¢ per quart for his strawberries and in his outstanding strawberry patches gets 35¢ per quart on a pick-your-own basis."

Case Study of a Roadside Market

Two Ohio State University students, Mitchell Lynd and Thomas Bennett, presented findings of their case study of the Lynd roadside market located on Route 40 east of Columbus. (The Lynd market handles 400 to 450 different items - spending about 1.6% of gross sales for advertising.) They jotted down license plate numbers of all customers stopping at the market between July 27 and September 1 and obtained the adresses of these individuals from the Bureau of Motor Vehicles and mailed a questionnaire to them.

Questionnaire replies revealed that 74% of the customers stopping at the market learned about it through roadside signs. During the period of the survey, customers from 31 states, the District of Columbia, and Ontario, Canada visited the market. The majority of the consumers came from the eastern part of Ohio. The majority of out-of-state customers came from Pennsylvania, New York and California - in that order.

The survey revealed that people living closer to the market stopped more often. Likewise the average purchase for city people (those individuals living in a city of 10,000 or more) was 27% higher than for rural people. The questionnaire requested the customers to rate the market on freshness of product, cleanliness, quality of product, flavor of product, appearance of product, selection of product, friendliness of salesmen, prices and interest to market. It was interesting to learn that everything rated higher during the week days than on the weekends. This is probably partially related to the increased activity from heavy weekend sales when customers received less personal attention.

A portion of the questionnaire obtained information from the customers about their attitude towards farm markets in general. Reasons listed why people go to farm markets were fresher produce, good selection, cheaper prices, better quality, homelier atmosphere, better attention by salesmen. The people also replied they would stop at farm markets more often if (1) they were closer (this would indicate a demand for more farm markets), (2) they had more money, (3) there was more selection besides fruit and vegetables, (4) signs appeared earlier, and (5) prices were well displayed. Some criticisms listed for farm markets in general were (1) many not clean and unattractive, (2) many sales people know nothing

about handling people or produce, (3) not enough parking space, (4) dirty trashy, unorganized, (5) dirty attendants. Some criticisms listed for the market where the survey was made included not enough shade, prices too high, traffic problem getting out of the market, trash cans overflowing, too many items, and too many gnats and flies. (Customers indicated gnats and flies could be controlled at fair grounds and consequently why couldn't they be controlled at roadside markets.)"

Preserving Cider

"Eldon Banta, Ohio State University Extension Horticulturist, distributed the following information at the Roadside Marketing Conference. Methods of preserving cider have been greatly improved and the following recommendations have been widely adopted by Ohio cider makers. Potassium sorbate (sodium sorbate may be substituted) is added to freshly pressed cider to produce a concentration of .05 to .075 percent. Adding seven ounces of potassium sorbate to each 100 gallons of cider produces a .05% concentration and 10½ ounces per 100 gallons makes a .075% concentration. The .05% concentration seems to keep cider as well as the higher concentration. Potassium sorbate is a completely safe preservative and imparts no off flavor to cider as did sodium benzoate when it was being used. Drug companies are the primary sources of the sorbate.

Fresh cider preserved with the potassium sorbate has been successfully kept for nine months at 35°F, 106 days at 40°F, but for only five days at 70° to 75°F. Treated cider must be refrigerated for long keeping and good flavor.

Proceedings Available Upon Request

The complete Proceedings of the Roadside Marketing Conference have been published and are available upon request by writing Prof. Edwin J. Royer, Extension Specialist, Fruit and Vegetable Marketing, Ohio Cooperative Extension Service, 2120 Fyffe Road, Columbus, Ohio 43210.

* * * * * * * * *

ORCHARD MOUSE IDENTIFICATION AND CONTROL TECHNIQUES

John W. Peterson, District Agent
U. S. Fish & Wildlife Service

Meadow and Pine Mouse damage may be serious in orchards. The presence of meadow mice is easily detected by their active surface trails, grass clippings, chewed apples, and girdled tree trunks and crown roots. Pine Mice, however, are often difficult to detect because of their subterranean habits. Pine Mouse damage to root systems causes irreparable injury to trees before they appear unhealthy. Surface signs indicating their presence are small mounds of loose soil, breather holes leading into deep tunnels and apples eaten from underneath. Meadow Mice are usually widely distributed in an orchard, whereas Pine Mice may occur in isolated colonies.

There are two distinct physical characters which separate Pine and Meadow Mice. The Meadow Mouse has conspicuous eyes and a tail that is twice as long as the hind foot while the Pine Mouse has inconspicuous eyes and a tail the same length as the hind foot.

Broadcasting of Zinc phosphide treated oats or apple gives adequate control of Meadow Mice but should not be relied upon to control Pine Mice. Where Pine Mice are widely distributed the placement of Zinc phosphide treated apple and oats at five foot intervals in artificial trail systems made by the trail building machine is preferable as it eliminates the search for mouse tunnels. The construction of a good trail is the key to success with the trail builder. This requires a good sod, reasonably moist soil, and a carefully adjusted cutting disc so that the sod is not turned over but merely lifted and dropped back into place. Baiting should be conducted in fair weather and only fresh baits should be used.

Where Pine Mice occur in isolated colonies, hand placement of Zinc phosphide treated oats or apples in the mouse tunnels will give excellent results.

The success of any mouse control method can be checked by comparing the mouse population before and several days after the control operation. This can be done by the use of snap traps baited with apple and set at right angles to the trail system. Equal numbers of traps should be set for the same length of time under similar weather conditions.

Zinc Phosphide Rodenticide and Zinc Phosphide treated steam-crushed oats are available from the following sources:

AGWAY INC. (formerly Eastern Farmers' Exchange and GLF)
Farm Bureau Association
Essex County Cooperative Farming Assn.

If it is not convenient to obtain these materials from the above, orders may be placed directly with: RODENT CONTROL FUND, University of Massachusetts, Old Conservation Bldg. Annex, Amherst, Mass 01003. All shipments are made via REA Express with shipping charges - COLLECT. These materials are classified as poisons and cannot be mailed.

NOTICE TO MASSACHUSETTS FRUITGROWERS

It has been called to our attention by the Massachusetts Division of Fisheries and Game that under Chapter 131, Section 87, as amended by Chapter 346, Acts of 1963, that a permit will be required to place poison in orchards for the control of mice. Requests for permits must be in writing and must state the specific area involved, bait to be used, and period of time during which such work will be conducted. Approval will only be granted for Zinc Phosphide-treated baits. Applications should be sent to the Director, James M. Shepard, Massachusetts Division of Fisheries and Game, 73 Tremont Street, Boston, Massachusetts.

* * * * * * * *

THE DISAPPEARANCE OF WATER CORE AND THE OCCURRENCE OF INTERNAL BREAKDOWN IN WATER-CORED RICHARED DELICIOUS DURING STORAGE

William J. Lord
Department of Plant and Soil Sciences

Delicious and its strains are susceptible to water core, a disorder chiefly associated with mature and over mature fruit. Mild cases of water core may disappear during storage, but severely affected fruit often develop internal breakdown. Since it is not always possible for growers to harvest their Delicious before they become severely affected with this disorder, it is essential to determine when internal breakdown appears during storage and if its occurrence can be predicted with any reliability.

Materials and Methods

To determine the disappearance of water core and the occurrence of internal breakdown in Red Delicious, fruit seriously affected with this disorder were harvested on October 10 and 15, 1963. Fruit harvested on each date were obtained from trees in separate blocks in the University orchards at Amherst.

The fruit were composited and one sample examined for the presence of water core within several hours of harvest and another after remaining at room temperature for 7 days. The percentage of water-cored fruit was recorded and its severity classified as slight (less than 30 percent), medium (30 to 50 percent), and severe (more than 50 percent of the cross-sectional area of the fruit affected). The remaining fruit were placed in regular cold storage at 32^{o}-36^{o}F in air within several hours after harvest. At approximately monthly intervals, two samples of fruit from each harvest date were removed from storage to determine the presence and severity of water core and internal breakdown. One sample was examined on the day of removal and the other after remaining at room temperature for 7 or 8 days.

Results

The percentage of fruit affected with water core decreased except during the last month of storage (Figure 1). Most of the water core of medium and severe classification disappeared from both lots of Delicious by mid-January, however (Figure 2). On the other hand, the data in figure 3 show that approximately 12 percent of the apples harvested on October 15, 1963, stored until November 12, and examined on November 19, had internal breakdown. Although not shown, approximately 6 percent of the Delicious harvested on October 10, 1963, stored until December 13, and examined on December 20, had internal breakdown.

The severity of internal breakdown increased during storage (Figure 1) and increased during the 7 day holding period at room temperature after each removal date (Figure 3).

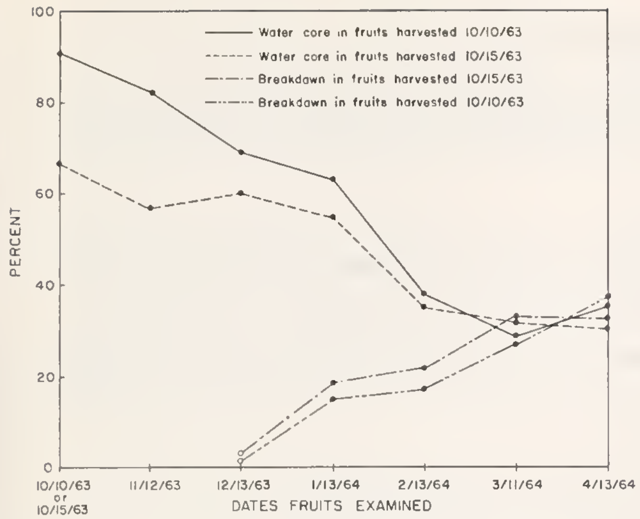


Fig. 1. The disappearance of water core and the occurrence of internal breakdown in Richared Delicious. Fruits examined at harvest and when removed from storage at monthly intervals.

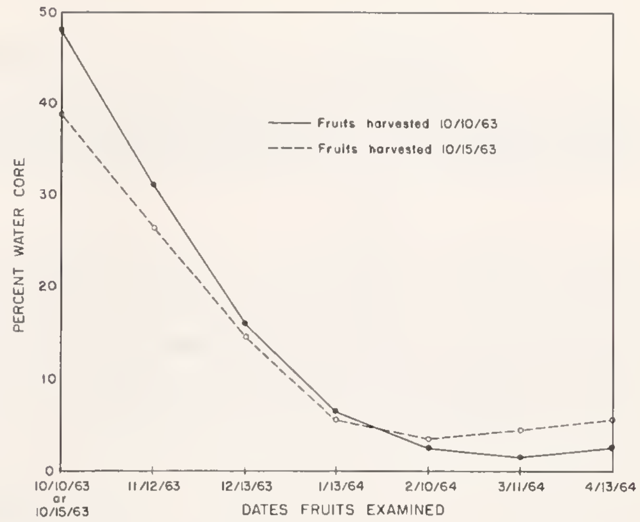


Fig. 2. The disappearance of water core of the medium and severe classification from Richared Delicious during storage. Fruits examined at harvest and when removed from storage at monthly intervals.

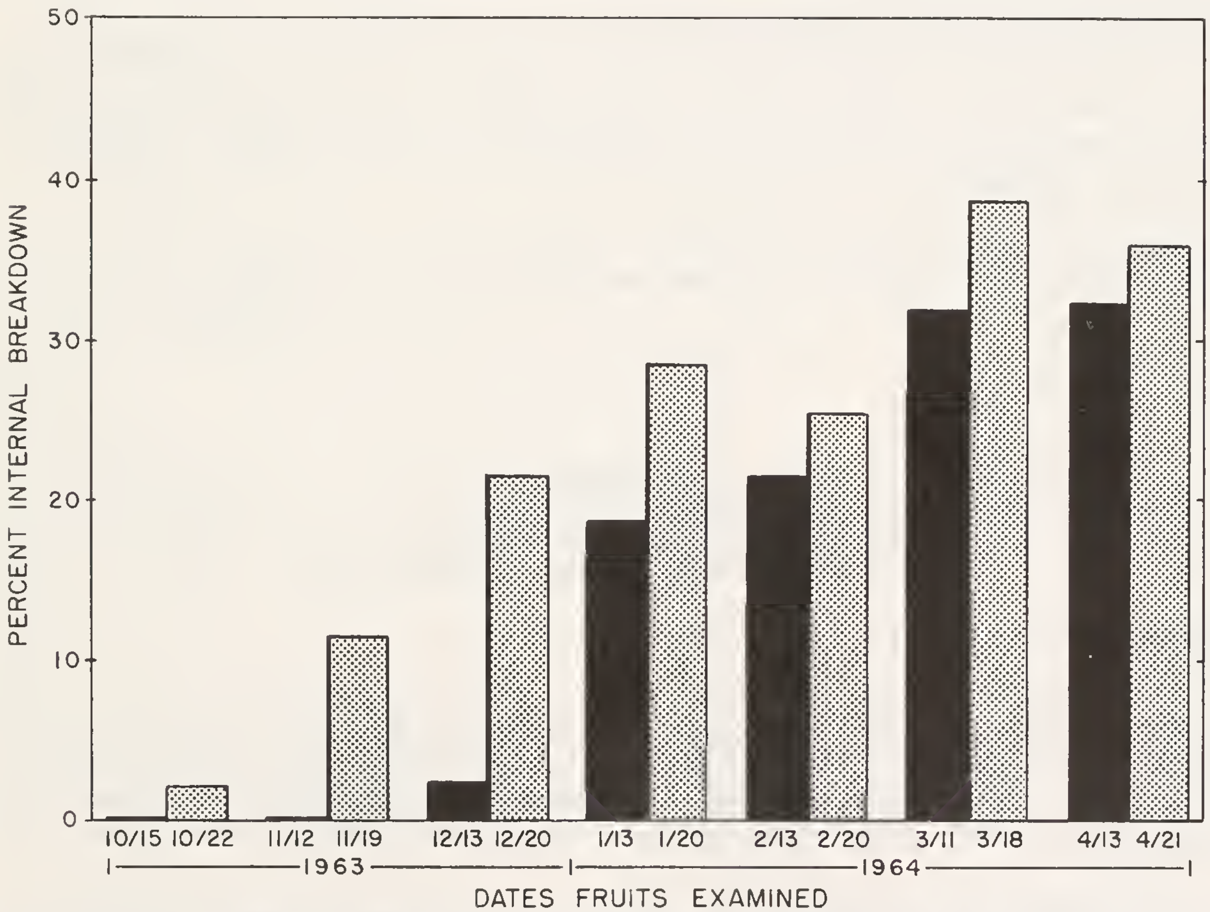


Fig. 3. The occurrence of internal breakdown in water-cored Richared Delicious during storage and following storage plus 7 days at room temperature. Fruit examined at harvest and when removed at monthly intervals and at monthly intervals plus 7 days at room temperature. Fruit harvested 10/15/63.

Summary

A study was conducted to determine the disappearance of water core from seriously affected Richared Delicious and the occurrence of internal breakdown.

Although water core gradually disappeared during the storage period, particularly that of the medium and severe classification (30 percent or more of the cross-sectional area affected), internal breakdown was serious within a month or two, depending upon the lot after storage. The severity of internal breakdown increased during a 7 day holding period at room temperature.

The data indicate that lots of Delicious seriously affected with water core should be sold as soon after harvest as possible.

* * * * * * * *

POMOLOGICAL PARAGRAPH

Emptying Containers at Roadside Stands - At many roadside stands, sales personnel transfer apples that are displayed in baskets to bags which are used as the "carry-home" package by the customer. At one of these stands the following sign was noted: "Allow Us to Empty Your Basket. We Are As Proud of the Bottom As the Top. In Exchange For The Basket We Gladly Give You A Dividend Of A Few Extra Apples."

This is good promotion! Also, it gives sales personnel an opportunity to make a final check on apple quality.

- - William J. Lord

* * * * * * * *

CIDER NOTES

K. M. Hayes
Department of Food Science & Technology

Refrigeration

Many cider mill operators including all Certified operators use refrigeration to preserve cider. Cider should be cooled immediately after pressing and stored at a temperature between 32 and 36^{o} F. At these temperatures, cider retains its original flavor for one to two weeks without danger of fermentation. Settling can take place under refrigeration.

Refrigeration is especially adaptable where cold storage facilities for fresh fruit are available. If a refrigerated room is not available, the operator can install an insulated metal or wooden tank and cool the cider with a small refrigeration unit.

For display purposes at roadside, used upright display cabinets with glass doors are excellent. These self-contained refrigerated units can be often purchased from companies supplying equipment to retail stores. Household refrigerators can also be used. The important feature when making and selling cider is to keep it under refrigeration at all times to maintain the quality.

Looking Back and Forward

With the beginning of a new cider season, perhaps a look at past years' activities is in order. If you can answer yes to the following questions and will do the same this year, customers will return to buy more.

1. Was my price competitive and fair?

2. Is my mill clean enough for customer inspection at any time?

3. Do I use only clean sound apples?

4. Do I blend two or more varieties?

5. Will my cider hold up at least 5 days without fermenting in a home refrigerator?

6. Are my press cloths clean and sweet smelling?

7. Do I use hot water and a sanitizing agent to clean my press and room?

8. Do I store my cider under refrigeration?

9. Do I use approved methods of fly control?

Sanitation

The keeping quality of cider is directly related to the sanitation practices observed during the operating season. Unsanitary practices foster the growth of micro-organisms, which cause fermentation or produce undesirable flavors in the final product.

After a day's run, observe the following procedures in cleaning the cider plant:

Dismantle the press for cleaning. Rinse it thoroughly with a hose to remove surface dirt. Scrub all parts of the press thoroughly, using a sanitizing or detergent-sanitizing solution. Where possible, use hot water for both the rinsing and the scrubbing operations.

Sanitizing compounds may be of the chlorine or quaternary ammonium types. Dairy-cleaning compounds are usually of these types, and they are easily obtained. Directions given by the manufacturer of the solution for cleaning dairy equipment will be satisfactory for cider plants.

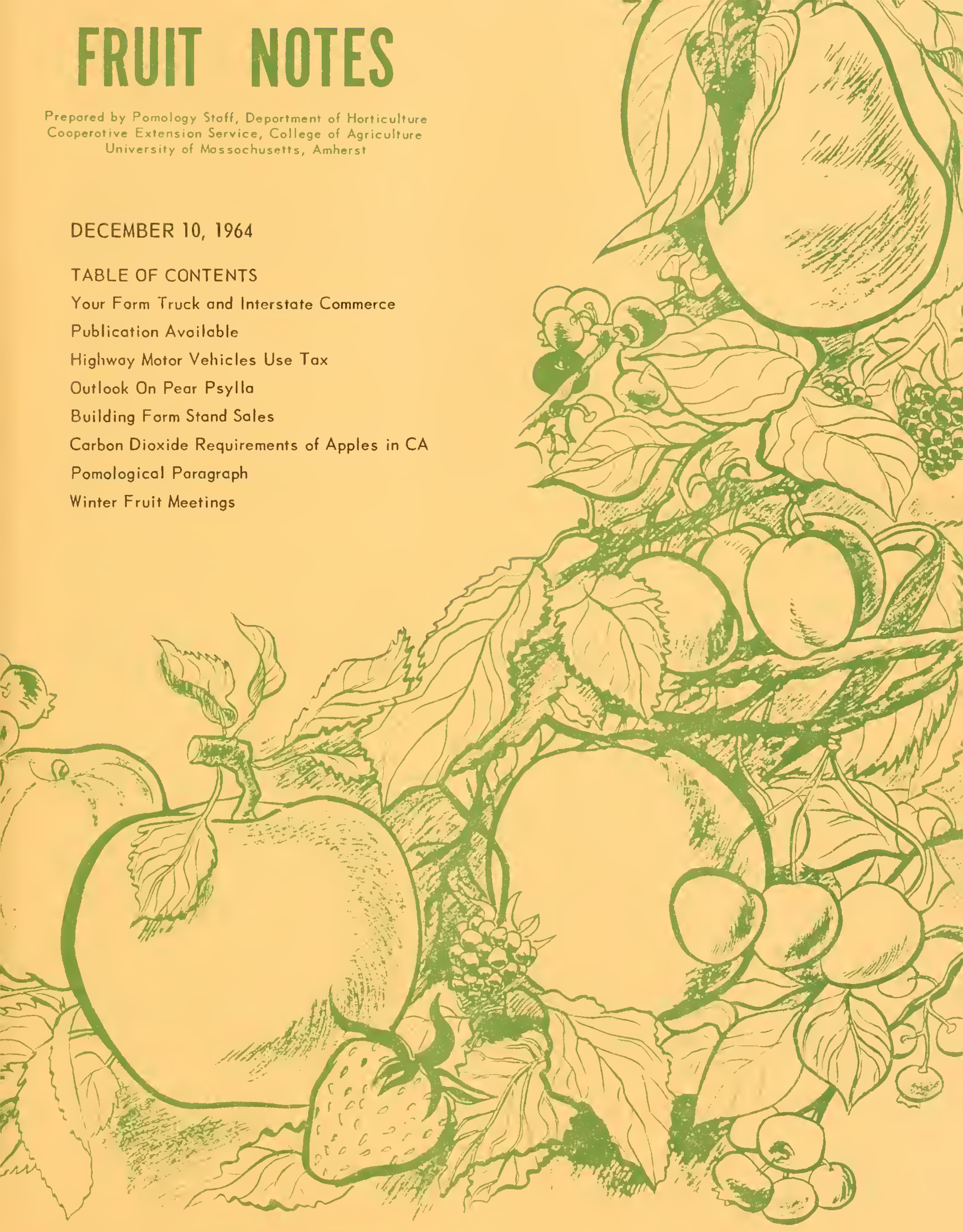
* * * * * * * *

FRUIT NOTES

Prepared by Pomology Staff, Department of Horticulture
Cooperative Extension Service, College of Agriculture
University of Massachusetts, Amherst

DECEMBER 10, 1964

TABLE OF CONTENTS



Issued by the Cooperative Extension Service, A. A. Spielman, Dean and Director, in furtherance of the Acts of May 8 and June 30, 1914. University of Massachusetts, United States Department of Agriculture and County Extension Services cooperating. Publication Approved by Alfred C. Holland, State Purchasing Agent, No. 44.

COUNTY EXTENSION AGENTS IN SUPPORT OF THE FRUIT PROGRAM

BARNSTABLE	Oscar S. Johnson, County Extension Agent in Agriculture, Cape Cod Extension Service, Barnstable (Tel. FOrest 2-3255).
BERKSHIRE, FRANKLIN, HAMPDEN and HAMPSHIRE	G. Everett Wilder, Pioneer Valley Extension Agent in Agriculture, Hampden County Improvement League, 1499 Memorial Avenue, West Springfield (Tel. Springfield REpublic 6-7204).
BRISTOL	Peter W. Stanley, County Extension Agent in Agriculture, Bristol County Agricultural School, Center Street, Segreganset (Tel. Dighton NOrmandy 9-3611 or 9-2361).
DUKES	Ezra I. Shaw, County Extension Agent in Agriculture, Dukes County Extension Service, Vineyard Haven (Tel. Vineyard Haven 694).
ESSEX, MIDDLESEX and WORCESTER	Max G. Fultz, Regional Agricultural Specialist, Middlesex County Extension Service, 19 Everett Street, Concord (Tel. Concord EMerson 9-4845).
NORFOLK	Howard Wilson, County Extension Agent in Agriculture, Norfolk County Agricultural School, 460 Main Street, Walpole (Tel. Walpole MOntrose 8-0268 or 8-0269).
PLYMOUTH	Dominic A. Marini, County Extension Agent in Agriculture, Plymouth County Extension Service, Court House, Brockton (Tel. Brockton JUniper 6-4993).

All pesticide chemicals mentioned in this publication are registered and cleared for the suggested uses in accordance with federal laws and regulations. Chapter 727, Acts of 1960, Commonwealth of Massachusetts requires that all pesticides sold in Massachusetts be registered with the Massachusetts Department of Public Health. Trade names, where used for clearness, do not indicate endorsement nor imply that similar products are not satisfactory.

WARNING! MOST PESTICIDES ARE POISONOUS. READ AND FOLLOW ALL DIRECTIONS AND SAFETY PRECAUTIONS ON LABELS. HANDLE CAREFULLY AND STORE OUT OF REACH OF CHILDREN, PETS AND LIVESTOCK.

YOUR FARM TRUCK AND INTERSTATE COMMERCE

Lawrence D. Rhoades
Department of Agriculture
and Food Economics

If you use your farm truck to transport property across state lines even if you own the property and drive the truck yourself, you may be subject to some provisions of the Interstate Commerce Act.

The important requirements:

(a) minimum age for drivers is 21 years
(b) a physicians certificate of physical examination for each driver (including owner drivers) must be obtained and kept on file.

Register must be maintained at principal place of business listing all accidents which result in death or injury of any person or in damage to property to an extent of $250 or more (Massachusetts law passed by last legislative session and effective now, requires report of accidents causing $200 of property damage).

Drivers must have at least (8) hours rest after each (10) hours of driving, and they may not drive after any combination of driving and on-duty time equalling fifteen (15) hours, nor may they be required nor permitted to remain on duty for more than sixty (60) hours during any period of seven (7) consecutive days. DRIVERS MUST MAINTAIN daily "drivers log" on the prescribed form which will show their entire activities during each twenty-four hour period. However, any driver used wholly in driving a motor vehicle having not more than two axles and whose gross weight does not exceed 10,000 pounds is exempt from the daily limitations on driving hours and need not maintain driver's logs, though he must observe the 60 hour on duty limitation.

Records of inspection, maintenance, repairs, lubrication and driver's trip report must be maintained.

Farm Trucks

Motor vehicles controlled and operated by any farmer when used in the transportation of his agricultural commodities and products thereof or in the transportation of supplies to his farm, are subject to the regulations above, which apply to private carriers with these modifications.

(a) If the vehicle does not exceed a gross weight, including the load of 10,000 pounds, the minimum age of the driver is 18 years not 21.

(b) Physical examinations and physician certificates are not required for drivers of farm trucks.

(e) Farm truck drivers must observe the daily and weekly limitations as to driving and on-duty time. However, any driver used wholly in driving a motor vehicle having not more than two axles and whose gross weight is less than 10,000 pounds is exempt from the limitation on driving hours, unless used to transport passengers, explosives, or other dangerous articles. Drivers of such vehicles are not exempt from the on duty limitations.

Most farmers transport by private carriage and if they wish may operate as private carriers when transporting their own commodities and supplies to and from their farms. NOTE the limitations above for farmers, if a farmer engages in private carriage and transports other products than his own products and supplies then he is a private carrier and the regulations of minimum age, physical exams, drivers log, etc. apply. A farmer must be one or the other, he can't be both.

Suggestions: Just in case, get a physicians certificate for yourself and anyone who drives for you (its a good idea anyway). Keep a drivers log, and keep a record of truck maintenance, repairs, lubrication and so on.

Whether you are a farmer or a private carrier, you do not have to have ICC plates, but depending on the size of the vehicle and its use, you are subject to some regulations.

Write to Joseph H. Lacour
District Supervisor
Interstate Commerce Commission
338 Post Office Building
Springfield, Massachusetts

for a copy of Motor Carrier Information Bulletin No. 3 and appendix, and to Superintendent of Documents, Government Printing Office, Washington, D. C. for 30 cents you can get printed "Motor Carrier Safety Regulations".

* * * * * * * *

PUBLICATION AVAILABLE

A. E. Departmental Series 363 entitled "A Review of Roadside Marketing" literature is available by writing the Department of Agricultural Economics and Rural Sociology, Ohio Agricultural Experiment Station, Wooster, Ohio.

J. E. Jeffries and M. E. Cravens, the authors, have presented the major findings of farm or "roadside" marketing studies on: (a) methods of retail selling; (b) location of stands; (c) physical facilities of roadside stands; (d) operating practices and policies; (e) advertising and promotion; (f) products sold; (g) maintaining product quality: (h) record keeping and, (i) characteristics of the customers.

* * * * * * * *

HIGHWAY MOTOR VEHICLES USE TAX

Lawrence D. Rhoades
Department of Agriculture
and Food Economics

The Interstate Highway System that is being built in the U. S. is financed in part by the Federal Gasoline Tax. The federal tax on tires and the Highway Motor Vehicle Use Tax.

Any highway motor vehicle with sizes larger than the limits below must pay a highway Use tax to the Internal Revenue Serviee.

Single Units

Two axled trucks for use as a single unit with actual unloaded weight in excess of 13,000 pounds.

For use in combinations

Two axled truck-tractor with actual unloaded weight of 5,500 pounds.

Who pays the tax?

The return and payment is made by the person to whom the truck is registered.

Tax year

July 1 to June 30

When is tax due?

Tax is due by the end of the month following the month when the vehicle is placed in use.

Penalties are provided for failing to file a return, for late filing and for filing a false or fraudulent return.

Form used, No. 2290, which is obtained from District Director, Internal Revenue Service, 174 Ipswich Street, Boston, Mass. 02215. Also ask for publication No. 349 I.R.S.

* * * * * * * *

OUTLOOK ON PEAR PSYLLA

H. E. Wave
Department of Entomology and Plant Pathology

The pear psylla, introduced into Connecticut about 1832, is a major insect pest of pears throughout the United States. Its role in pear culture is being reexamined by entomologists of the New York Agricultural Experiment Station.

In an article appearing in the March-May 1964 issue of Farm Research, a quarterly bulletin published by the New York State Agricultural Experiment Station, entomologists, A. L. Jones and E. H. Smith state that the renewed interest in pear growing, especially the practice of increasing vigor of the trees to obtain better yields, is expected to favor the increase of such insects as the pear psylla.

The pear psylla is reported to have developed resistance to insecticides in the Pacific Northwest and there is a real likelihood that this could occur in the East. Studies by the New York State Agricultural Experiment Station have shown that under some conditions psylla may increase fire blight infections.

In order to obtain more effective and lasting controls, they are re-evaluating some earlier research on this pest, including the insects biology.

The psylla overwinter as adults under loose bark of pear trees. They begin their activity earlier in the spring than most other pear insects. During warm days in March and April they begin depositing their eggs in crevices on fruit spurs and on the new leaf growth as it emerges.

Late season build up of psylla has been observed to occur in pear plantings which results in a large overwintering population. This would suggest the possible need for either a late season or a spring-dormant spray treatment to assure low population levels early in the season.

Dormant applications of 60-second petroleum oils have proven highly effective against all stages of the psylla except eggs. Besides killing adults and nymphs, petroleum oils also prevent egg laying by adults until after green tissue appears. Adults appear to be killed only when spray deposits hit them directly whereas nymphs may be killed by the oil deposits as they crawl over it to the emerging leaf tissue. While oils are not effective ovicides against this pest, they do provide satisfactory control by preventing oviposition of adults and by killing newly emerged nymphs.

* * * * * * * *

BUILDING FARM STAND SALES

G. W. Wilder
Regional Agricultural Agent

Attitude

1. Be friendly - One reflects his attitude upon others.

2. Take a personal interest in your customers - Inquire about them, their children, pets, or car if it is new.

3. Learn to call them by name - Everyone like to be recognized.

4. Be concerned about their wants and needs - Sell the customer the variety or varieties most suitable for his needs. The saying, "The customer is always right," commands respect, however.

5. Sell each customer something - If possible to do so without offense, be agressive.

6. Invite each customer to come back - This tells him that you appreciate his patronage.

Appearance

1. Salesroom, farm and sales personnel should be neat and clean - Most people prefer to buy where conditions are tops.

Gimmicks to Attract Customers

1. Large sign at farm entrance - Attractive signs draw the attention of potential customers.

2. List of apples grown on farm - Post this in your salesroom. It is an introduction to the kinds of fruit that are available.

3. Provide samples - with sign "Try one" or other appropriate wording. This is especially helpful in introducing new varieties.

4. Use your imagination - Draw on entire family for suggestions. Visit other roadside stands and salesrooms to get ideas.

Complimentary Products

1. Sweet cider - without a doubt the biggest drawing card other than apples.

2. Jam and jellies - make attractive displays.

3. Maple syrup - A good item on many stands.

4. Gift cartons - Appropriate before Thanksgiving and Christmas.

Advertising

1. Signs on busy highways - Used to advertise your farm and direct customers to it.

2. Make good use of the newspapers - One of the most productive forms of advertising. People will travel a long way to buy if they like you and your product.

3. A satisfied customer is your best form of advertising.

* * * * * * * *

CARBON DIOXIDE REQUIREMENTS OF APPLES IN CA

William J. Lord
Department of Plant & Soil Sciences

The placement of lime in CA rooms to supplement caustic or water scrubbing is being practiced by many storage operators. Since the possibility of maintaining extremely low CO_2 levels (less than 2%) exists, growers have asked whether these levels would be detrimental to the keepability of apples. Recently, we came across a report by S. W. Porritt in the Summary Report of Research 1962, Summerland, B. C., and published in September, 1964, which throws some light on the subject.

Porritt reports that near 0% CO_2 with 3% O_2 results in more rapid softening, greater rate of acid loss and considerably more physiological disorders than atmospheres with 2% or more CO_2. "Flesh browning of Newtown, McIntosh, and Spartan apples, skin bronzing, probably allied with scald, browning of vascular bundles in Spartan, and a general increase of mold growth have been consistently associated with near 0% CO_2 atmospheres."

Data of this type indicate that growers should strive to maintain the CO_2 level in McIntosh rooms at 2 -3% for the first 4 - 6 weeks and 4.0 - 5.5% thereafter. The indiscriminate use of lime withing CA rooms should be avoided if one is to be sure of CO_2 levels above 2% throughout the storage period.

* * * * * * * *

POMOLOGICAL PARAGRAPH

Printing on Polyethylene Bags - Several years ago it was suggested that printing on polyethylene bags be placed the long way of the bag since most bags are displayed on their sides in stores. Some growers have adopted this suggestion. In the writer's opinion, the variety name should be featured on the bag with the amount of printing kept to a minimum.

- - William J. Lord

* * * * * * * *

WINTER FRUIT MEETINGS

The 71st Annual Meeting of the Massachusetts Fruit Growers' Association, Inc., in cooperation with the University of Massachusetts Extension Service will be held in the Leominster Armory, Gardner, Massachusetts, on January 6 and 7, 1965. The Leominster Armory is located only a short distance off of Route 2, when turning north on Route 13, heading towards North Leominster.

The complete program is not available at this time. However, the program at present includes the following:

Dr. W. J. Lord, University of Massachusetts
What We Have Learned From Irrigation Studies

Dr. G. N. Agrios, University of Massachusetts
Apple Cankers and Dieback

Dr. L. F. Hough, Horticulture and Forestry Department, Rutgers University
Peach and Nectarine Varieties

Dr. Dean Asquith, Pennsylvania State University
Research Findings on Mite Control

Mr. Paul Bohne, area supervisor, Research and Development Department, United States Rubber Company, Naugatuck Chemical Division
The Amazing Possibilities of a Plant Growth Regulator in the Future of Fruit Production

Dr. F. W. Southwick and Dr. W. J. Lord, University of Massachusetts
Preliminary Research Findings with B-9

Dr. D. H. Palmiter, Hudson Valley Laboratory, Highland, New York
Recent Developments on Apple Disease Control in the Hudson Valley

Dr. H. E. Wave, University of Massachusetts
Changes in Insect Control Recommendations for 1965

Dr. Charles Maxwell, Canada Dept. Agr. Res. Sta., Fredericton, New Brunswick
Research Findings on Apple Maggot Control

Dr. L. F. Michelson, University of Massachusetts
Moisture Extraction and Rooting Habit of Apple Trees

Dr. C. J. Gilgut, University of Massachusetts
Changes in Disease Control Recommendations for 1965

Mr. Delmer Robinson, Jr., President of the National Apple Institute
Mr. Fred Corey, Executive Vice President, National Apple Institute
Trends of the Apple Industry - National and Internationally

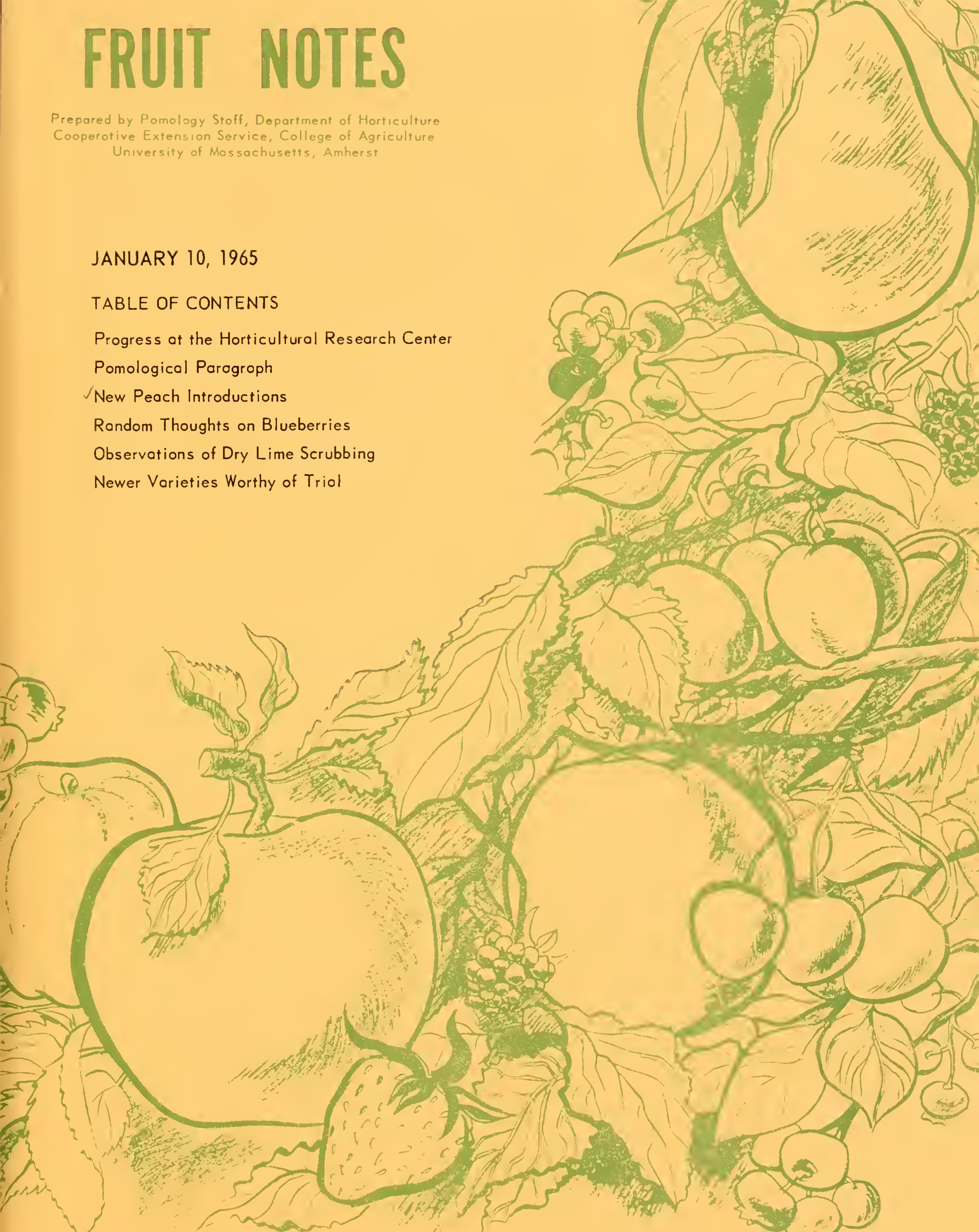
* * * * * * * *

FRUIT NOTES

Prepared by Pomology Staff, Department of Horticulture
Cooperative Extension Service, College of Agriculture
University of Massachusetts, Amherst

JANUARY 10, 1965

TABLE OF CONTENTS



Issued by the Cooperative Extension Service, A. A. Spielman, Dean and Director, in furtherance of the Acts of May 8 and June 30, 1914
University of Massachusetts, United States Department of Agriculture and County Extension Services cooperating.
Publication Approved by Alfred C. Holland State Purchasing Agent, No. 44.

PROGRESS AT THE HORTICULTURAL RESEARCH CENTER

As you may recall, in the fall of 1961 it became apparent that the old University of Massachusetts orchard area in Amherst, which had been available for fruit research and teaching purposes for over 50 years, was needed for dormitories to accomodate an additional 1,300 students at the University. When this information was made known to the Directors of the Massachusetts Fruit Growers' Association, Mr. Jonathan Davis, Derwood Frost, Elmer Fitzgerald, G. Stacy Gay and Jesse Rice were authorized to see what could be done to establish a new site for fruit and other horticultural research and teaching at the University.

This group found the Robert Hanifin Farm at Belchertown available and immediately initiated a fund raising campaign for its purchase so that it might eventually be presented to the University for continued horticultural research and teaching. By the spring of 1962 over $40,000 was pledged by approximately 200 individuals, associations and industries which have an interest in commercial horticulture in Massachusetts and New England. On June 26, 1962, at a banquet sponsored by the University administration, with Dr. John W. Lederle, President; Dr. Frank L. Boyden, Chairman, Board of Trustees; Dr. A. A. Spielman, Dean of the College of Agriculture and the Massachusetts Fruit Growers' Association Directors as invited guests, this Horticultural Research Center was presented to the Trustees of the University of Massachusetts as a Trust. We are certain that gifts of this sort to universities are rare. Also, the contributors have been so interested in this project that 100 per cent of the money pledged has been received.

The Horticultural Research Center consists of about 215 acres of land, what was once a dairy barn complex, a common storage and a farm house. About 75 acres of cleared land appear to be very suitable for fruit. The remainder is either in woodland or pasture. This center is 15 miles from Amherst and is situated above much of the surrounding countryside, with an excellent view of the distant Holyoke Range.

In order to put the land and buildings in shape for experimental purposes following its acquisition by the University, much effort, time and additional money has been expended. The following is a list of the major accomplishments at this Research Center during the past two years.

1. Prior to planting trees approximately one mile of tile drains were laid to improve soil drainage in two large areas.

2. The barn complex has been extensively repaired and repainted. Concrete floors, asphalt driveways, overhead doors, toilet facilities, rewiring and heating systems have been installed so that we now have good facilities for storage and servicing of equipment and supplies plus comfortable working quarters for the orchard foreman and his labor force.

3. Approximately three miles of deer fence (eight feet high) has been erected around the areas which are to contain the horticultural plantings. The presence of deer in large numbers made it virtually impossible to grow trees otherwise.

4. About 1,000 fruit trees plus several species of small fruits and ornamental crops have been planted. From these and future plantings we expect to obtain new information relating to rootstocks, viruses, insect and disease control, nutritional requirements for fruit trees, new strains of our important varieties, influences of chemicals to tree performance, etc.

5. The house where the orchard foreman is to reside after November 1, 1964, has or will have, a completely new heating system, new concrete cellar floor, rewiring, modern plumbing, considerable remodeling, reroofing, plus exterior painting.

6. Within about two years from now a new cold storage and packing facility is expected to be constructed at this Research Center. This building which is now in the planning stage should contain a variety of CA storage rooms up to small commercial size, a large packing area, and research and teaching laboratories.

Trustees of the Horticultural Research Fund

****

Pomological Paragraph

Fruit Varieties Recommended for Massachusetts - The following Special Circulars which list varieties recommended for Massachusetts are available through your county extension service or by writing to the Mailing Room, University of Massachusetts.

Circular Title	Circular No.
Varieties of Apples for Massachusetts	212-A
" " Peaches for Massachusetts	212-B
" " Pears & Quinces for Massachusetts	212-C
" " Strawberries for Massachusetts	212-D
" " Blueberries for Massachusetts	212-E
" " Blackberries & Raspberries for Massachusetts	212-F
" " Grapes for Massachusetts	212-G
" " Plums for Massachusetts	212-H

William J. Lord

****

NEW PEACH INTRODUCTIONS

W. D. Weeks
Department of Plant & Soil Sciences

Several new peach varieties have been recently introduced which appear to be worthy of trial. However, we do not have these introductions established at the Horticultural Research Center in Belchertown at present, so the variety descriptions are based primarily on the originator's descriptions. Some of the introductions are so recent that trees may not be available for planting this season. The varieties will be listed in approximate order of ripening.

Reliance is a new introduction from the New Hampshire Agricultural Experiment Station which is extremely bud hardy. It has survived minimum temperatures of -25°F. The fruit is nearly round, moderately fuzzy and has a dull red color. The bright yellow flesh is juicy, medium firm, slightly stringy, of good flavor and ripens with Golden Jubilee or about 24 days before Elberta.

Washington is the first of a new series of introductions from Virginia. Its flowers are reported to be extremely tolerant of spring frosts. The fruits are round ovate in shape. The skin is about three fourths covered with bright red color. The flesh is orange yellow with bright red at the pit. The flesh is fine textured; its flavor resembles Sunhigh but is slightly more acid. Washington ripens about 3 days after Triogem or 21 days before Elberta.

Glohaven is one of Stanley Johnston's latest introductions from Michigan. Its fruit buds and blossoms are above average in hardiness. The fruits are large and nearly round in shape. The skin is highly colored and has very light pubescence or fuzz. Fruit flesh is clear yellow and firm textured. There is very little red color around the pit cavity. The fruit ripens just after Halehaven or about 14 days before Elberta.

Redqueen was selected by the New Jersey Agricultural Experiment Station because of its bud hardiness. The fruit is large, well colored and of good quality. It has as much firmness and shelf life as Elberta. It is of the same season as Glohaven or about 14 days before Elberta.

Cresthaven is another introduction from Michigan which is above average in wood and bud hardiness. Fruits are medium-large and nearly round in shape. Fruit skin has an abundance of bright red color with no noticeable pubescence. The flesh is clear yellow and firm textured. There is considerable red color around the pit cavity. Cresthaven ripens between Summercrest and Blake or about 7 days before Elberta.

Madison is one of the frost resistant introductions from Virginia. The fruit has medium size and is highly colored. Pubescence is short and fruit is above average in attractiveness. The flesh is bright orange yellow, firm and fine textured. It has a mild, rich flavor. It ripens 7 days before Elberta.

Jerseyqueen is a New Jersey peach which was introduced to replace Elberta. Fruits are well colored being bright red, large, round and firm. Flesh is yellow with very good mild flavor. The fruits of Jerseyqueen hold up very well in shipping and handling. It ripens with Elberta.

Jefferson is another of Virginia's introductions which has blossoms that are resistant to spring frosts. The fruits are large and well colored. The flesh is yellow and comparable to that of J. H. Hale in firmness and flavor. Jefferson ripens two to three days after Elberta.

****

RANDOM THOUGHTS ON BLUEBERRIES

William J. Lord
Department of Plant & Soil Sciences

Blueberry variety recommendations for Massachusetts remain the same as for the last several years. Earliblue, Blueray, Bluecrop, Berkeley, Jersey and Coville appear to be the principal varieties being planted.

Although interest in cultivated blueberries appears to increase yearly, the writer is of the opinion that the acreage increase has been less startling. Most of the planting has been done by home gardeners and persons that desire to supplement their incomes by growing cultivated blueberries.

Prevention of bird depredation continues to be the principal problem for growers of cultivated blueberries. Several companies are now selling netting for bird control. Although the cost of netting is high, without it growers with small acreages would soon be out of the blueberry business. As it was pointed out by Prof. J. S. Bailey in a previous issue of Fruit Notes, the berries saved and the increased fruit size possible by delayed harvest will go a long way toward paying for covering the bushes with netting. For those who are interested, a list of companies selling netting can be obtained by writing your County Agent.

The use of a starling trap proved beneficial to a grower using this device for the first time last year. Experience with these traps is limited in cultivated blueberries, but their value in lowbush blueberry fields is not questioned.

Last summer a letter was received asking if by chance some cultivated blueberries purchased had been harvested green by the grower and then ripened by some process. Although they appeared attractive when purchased, the person stated that they were the most tart and acid blueberries ever produced. Unfortunately, this is the reputation gained by cultivated blueberries with many customers.

Growers know better than the writer how to regulate harvest to insure better flavored berries. Picking once a week is usually often enough. Even then, pickers should be cautioned against harvesting berries with reddish tinge around the stem.

****

OBSERVATIONS OF DRY LIME SCRUBBING

William J. Lord
Department of Plant & Soil Sciences

Information obtained by the Extension Pomologist indicates that 13 CA rooms are being dry-lime scrubbed in Massachusetts during the 1964-1965 storage season. In addition numerous growers placed lime in rooms to supplement the caustic, water or dry lime scrubbers.

As of December 10, the dry lime scrubbers are maintaining the desired carbon dioxide level with the exception of 2 rooms at one storage. The difficulty at the storage was corrected by changing the lime.

Lime in amounts as high as 0.53 pound per bushel of apples was stacked in rooms to supplement the scrubbers. The effectiveness of lime for maintaining carbon dioxide at the desired level varied considerably and was not directly related to the amount used. For example, one room with 0.47 pound of lime per bushel of apples was caustic scrubbed the 11th day after closing. At another storage, 0.29 pound of lime per bushel of apples held the carbon dioxide below 5.0 per cent for 54 days.

The savings in caustic with the use of lime in the rooms was considerable. It appears difficult, however, to predict the effectiveness of a given amount of lime.

Research indicates that atmospheres of less than 2 per cent carbon dioxide for McIntosh may be deleterious to the fruit. The time period that carbon dioxide was below 2 per cent varied from 1 to 20 days after closing in the storages using lime as a supplement to scrubbing. Whether or not a 20 day period below 2 per cent carbon dioxide would be deleterious to the fruit is not known. Growers that use lime as a supplement to scrubbers might devise some way to restrict air movement around the lime bags. The suspension of a polyethylene sheet over the lime which can be raised or lowered is a possibility.

It is anticipated that other growers will convert to dry lime scrubbing next year. The placement of a fan in the lime box is recommended. Some may wish to keep the caustic scrubber connected as an emergency method of scrubbing.

A word of caution, the lime box should be well constructed and reinforced to prevent deflection, which could result in a leak, when the lime is placed in the box.

****

NEWER VARIETIES WORTHY OF TRIAL

James F. Anderson
Department of Plant & Soil Sciences

The following report briefly describes the newer fruit varieties under test in the University plantings that are worthy of trial by commercial growers and home gardeners.

STRAWBERRIES

Among the recently introduced varieties that one might consider for planting in Massachusetts are Fulton, Frontenac, Fletcher, Midway and Vesper.

Since the performance of a strawberry variety is greatly influenced by climatic soil and cultural conditions, it is suggested that growers test any new variety on a small scale before planting it on a commercial basis.

Fulton - A mid-season variety which has performed very well in Amherst. The plant is vigorous, a good runner producer, very productive and free from leaf diseases. The fruit is medium in size, attractive, very firm and of very good flavor. Fulton is not resistant to red stele.

Fletcher - The plant is vigorous and a good runner producer. The yield is good. The fruit ripens in the late mid-season, is large, firm, attractive, very good in flavor and is said to be an excellent freezer. Fletcher has no resistance to red stele.

Frontenac - The fruit is large, medium to dark red in color, attractive, good in flavor and moderately firm. Frontenac is said to be excellent for freezing. The plants are large and form sufficient runners for a good bed. Frontenac is susceptible to drought, which could account for its failure to reach its full yield potential in our trials last summer.

Midway - A mid-season variety ripening with or slightly before Catskill. The plants are vigorous, good plant makers and very productive. Midway is resistant to the common races of red stele, but may show some mildew. The fruit is medium to large, deep red, glossy, attractive and very good in flavor. Variable size and a tendency for green tips has been noted in past trials. Midway is well worth trial in commercial quantities, especially in soil where red stele has been a problem. Midway performs best on soils of good moisture holding capacity.

Vesper - The plant is large, vigorous and a good runner producer. The fruit ripens very late, two to three days after Jerseybelle. Yields have been considerably higher than Jerseybelle in our Amherst trials. Vesper is a little darker red than Jerseybelle, is very large in size, has prominent yellow seeds and a glossy skin, all of which make it very attractive. The fruit is moderately firm and good in flavor. Limited observations by growers indicate that berries should be harvested while light red in color. Dark berries may be soft and non-marketable. This variety merits trial because of its lateness, productivity, large size and attractiveness. It should not be planted where red stele is a problem.

Data as to season, berry size and yield for some of the more important varieties that were included in 1964 trials will be found in the following table.

STRAWBERRY VARIETY EVALUATION - 1964
University of Massachusetts
Horticultural Research Center
Belchertown, Massachusetts

Variety	Season (1) % Early	% Late	Berry Size (2) 1st	3rd	5th	Number of Pickings	Calculated Yield Quarts per Acre
Earlidawn	56	0	272	227	185	7	11,384
Midway	13	9	383	337	254	8	13,242
Fulton	9	10	329	266	185	8	12,974
Sparkle	9	19	285	227	192	8	7,732
Catskill	7	21	372	360	291	9	14,941
Fletcher	5	27	366	301	230	9	9,917
Frontenac	3	40	267	277	310	8	7,144
Vesper	0	70	466	389	303	8	13,649

(1) Season June 10 to July 6 (11 pickings)
% Early - percentage of total crop of each variety picked in first 3 pickings
% Late - percentage of total crop of each variety picked in last 3 pickings
(2) Berry size - average weight in grams of 25 berries

PLUMS

Those Massachusetts growers contemplating planting plums are referred to Special Circular 212-H Plum Varieties for Massachusetts. Varieties suggested for commercial planting in that circular include Formosa, Santa Rosa, Yakima, and Stanley.

Formosa - A Japanese type plum ripening during the first week of August. The fruit is large, attractive, red blushed and of very good quality. The trees are moderately productive and the fruit holds up well in stor-

age. Santa Rosa, another Japanese type plum ripens about a week later than Formosa. The fruits are large, attractive, reddish purple and of good quality. Santa Rosa handles and keeps well. The trees are moderately productive.

Yakima - A European type plum that ripens in the third week of August. The fruits are large, prune shaped, reddish purple, freestone and of good quality. The tree is moderately productive.

Stanley - An attractive prune type plum which is suitable for both canning and fresh use. The fruits are blue in color, medium to large in size. The flesh is greenish yellow, juicy, firm and of good quality. Stanley is a freestone variety that ripens in early September. Stanley is both productive and annual.

Among the newer plum varieties tested at Amherst, the following show merit and might be worthy of trial.

Burmosa - A Japanese type plum introduced by the California Experiment Station. The tree is small in size and of medium vigor. Production was heavy in 1964. Indications are that Burmosa may tend to be biennial. The fruit is yellow with a reddish blush, good in quality and a freestone. Burmosa ripens in late July.

Great Yellow - A Japanese type plum ripening in early August. The fruit is of good size, good quality and a freestone. The tree is productive and the fruit hangs well on the tree. Great Yellow ripens with Shiro and is superior to Shiro in size and quality. Shiro may have an advantage in color and firmness.

Howard Miracle - A large, attractive, high quality Japanese plum. The fruit is a golden yellow with a light red blush. The firm fleshed fruit was picked during the third week of August. Production was light, due to poor fruit set this past season.

Pacific - An attractive prune type of plum of high quality. The fruit is quite firm and keeping quality appears to be excellent. The fruit ripens in mid-September. Ripening has been uneven. Pacific has been a good producer in Amherst.

PEARS

Chapin - A seedling of Seckel that is harvested in early August. The fruit is small to medium in size, green with a red blush. Chapin resembles Seckel except for a more prominent neck. The flesh is fine textured, juicy, free of grit cells and of good quality.

Devoe - The fruit is a clear yellow often with a blush-red cheek, oblong pyriform in shape and of good quality. Devoe has been a heavy producer with a tendency to ripen unevenly. The fruit was harvested in the second week of September and held in storage until December. Devoe is worthy of trial.

Packham's Triumph - The fruit is large in size, greenish yellow in color, free from blemishes and although the surface is somewhat rough it is an attractive pear. The flesh is white, fine melting, free of grit cells and of very good quality. The fruit is harvested in late September and holds up well into early January. As the fruit was harvested from a top-worked tree, an evaluation of tree characteristics cannot be given.

Alexander Lucas - A late ripening pear of medium size, smooth surface, obovate, obtuse-pyriform shape and greenish yellow color. The fruit is of good quality. Alexander Lucas was harvested in the third week of September and keeps well into December. Production appears to be satisfactory.

Dumont - A late ripening pear of medium size, obtuse pyriform shape and yellow color. The flesh is firm, juicy and the quality very good. The fruit is harvested in late September and has kept well into early January in the past years. The variety has been productive under our conditions and is worthy of trial.

****

FRUIT NOTES

Prepared by Pomology Staff, Department of Horticulture
Cooperative Extension Service, College of Agriculture
University of Massachusetts, Amherst

FEBRUARY 15, 1965

TABLE OF CONTENTS

Issued by the Cooperative Extension Service, A. A. Spielman, Dean and Director, in furtherance of the Acts of May 8 and June 30, 1914; University of Massachusetts, United States Department of Agriculture and County Extension Services cooperating. Publication Approved by Alfred C. Holland, State Purchasing Agent, No. 44.

INSURANCE

Lawrence D. Rhoades
Extension Specialist in Farm Management

Rarely does the morning edition of the newspaper or the early morning radio news report come out without a report of a fire loss. Frequently, the report reads something like this:

"Fire Chief_________estimates the damage at $30,000 PARTIALLY COVERED BY INSURANCE" (capitals are ours).

If you haven't changed the amount of insurance coverage on your property, your barn, poultry house or fruit storage, in the past 5 years, the likelihood is that your insurance coverage is less than it should be. Why? First, building costs have continued to increase; second, additions may have been made; third, buildings may have been remodeled or extensively repaired without increasing the insurance coverage.

It's too late to read your policies after the fire occurs.

Here are some questions to ask your insurance agent.

How much insurance do I have and what risks are insured?

Do any of my policies have a co-insurance clause?

A co-insurance clause usually results in a lower premium, but it works this way.

Assume you have equipment valued at $10,000. Your policy, if it has the common 80% co-insurance provision, should be for $8000. But insurance costs money, so you insure for only $6000. If the property is completely destroyed, your company will pay you $6000. But, what if you have a partial loss, say half the the property is destroyed? Do you get $5000 compensation, half the value, since the loss is less than the coverage? The answer is NO. Your compensation would be figured:

Actual Insurance amount divided by the amount of insurance that should be carried times the amount of the loss or

$$\frac{6000}{8000} \times 5000 = \$3750 = \text{the amount paid on your loss.}$$

Why? You didn't keep your part of the bargain and carried only 3/4 of the coverage you said you would when you accepted the policy terms by paying the premium.

Ask your agent how a loss would be settled on your farm buildings.

If you bought property and an insurance policy was assigned to you, the insurance company must assent (agree) to the assignment.

If the property is mortgaged, a "loss payable clause" should be part of the policy to protect the lender, and indirectly, you.

Ask your agent the insurable value of your property. Mistakes do occur, particularly if several agents or companies are involved, and insurance may be written for more than the insurable value of the property. However, no insurance company will pay for more than its share of the actual cash value of the property at the time of a loss, even if you've paid for the extra coverage.

Ask your agent to tell you what circumstances will suspend or void your policy.

Don't overlook insurance on feed and stored crops.

Remember that livestock are often smothered rather than actually burned; be sure that death losses from this cause are covered.

Provide more than one means of entrance and exit to buildings for both animals and humans, and be sure that these are not blocked and that doors open out, not in.

Fire extinguishers are actually worth their weight in gold if they are of proper type and size and are properly located.

Buildings deserve lightning rod protection in many locations. Proper installation with an "underwriter's label" will reduce your insurance premium rate. In some locations, trees near a building should have lightning rods.

Farm fires usually cause heavy losses, often because the fire has a good start before it is discovered.

Several companies manufacture fire alarm systems which are simple to install and which can be placed in areas where fires are likely to start, such as near electric motors that are likely to overheat. Systems can be self-contained alarm units, or a series of temperature sensing units set to go off and trip an alarm, wired in a low voltage circuit to an alarm bell. Knowing when and where a fire is starting, or likely to start, may make it possible to reduce fire losses, since fires have small beginnings.

Three rules for insurance buyers.

A. Buy comprehensive ("wide" or "many risk" coverage) insurance when available.

B. Buy deductible insurance when you can. (You assume the first $50 or $100 of a loss.)

C. Buy insurance against the calamity.

Because many buildings were wired for electricity some years ago, and in many cases additional electric equipment, fans, electric motors, heaters, coolers, and electric lights have been added, original wiring

may be overloaded and may be a potential hazard. Electric wiring and circuits should be checked by a competent electrician if new equipment has been added. Fires caused by faulty wiring are on the increase!

****

Pomological Paragraph

15,000 Shopping Centers by 1975 have been predicted by the International Council of Shopping Centers. Just 17 years ago there were only about 50 shopping centers in the U.S. The current growth rate sees one center opening every 10 hours each day of the year. By 1970, a mere 2,000 retailers may be doing close to 40% of all retailing. This would leave about 1,200,000 stores to handle the balance of the business. Further, the shopper is changing; the woman shopper today accounts for about 50% of retail expenditures vs. 85% a few years ago. In about 5 years the American consumer is expected to spend more money on services than on non-durable goods. Self-service will be even more commonplace than today. These retail trends are worthy of note and serious consideration.

L. D. Tukey - Pennsylvania State Horticultural Reviews

****

RESEARCH FROM OTHER AREAS

William J. Lord
Department of Plant and Soil Sciences

The Effect of Type and Season of Pruning on Growth and Yield of Dixigem Peach Trees.

E. F. Savage, et. al., Georgia Experiment Station, Athens, Georgia, report that yields, fruit size, and tree growth were essentially the same on Dixigem peach trees pruned vase-shaped as compared to the modified leader system. (Vase-shape trees are opened center trees with 3 or 4 scaffolds rising from the trunk at about the same height. Modified leader pruned trees, which are recommended for Massachusetts, have 3 to 5 main scaffold limbs equally distributed around the tree and are at least 6 inches apart vertically.)

The labor requirement to maintain vase-shaped trees was considerably higher since the prunings removed from these trees averaged 33.9 per cent heavier than those from modified leader trees.

Modified leader trees were found to be less subject to damage from low temperatures because they had fewer horizontal limbs.

Summer pruning (early August), in comparison to pruning during the dormant season, resulted in dwarfing and a gradual decline in yield. Summer-pruned trees were more susceptible to cold injury, also.

****

MARKETING NEW ENGLAND APPLES

Rockwood Berry
310 State Street
Springfield, Massachusetts

The apple production in New England, New York and New Jersey represents about 25% of the National crop or more than 33,000,000 bushels. We know that apples from this area are marketed in at least 15 of the major United States terminal markets. Why isn't this production sold entirely within the growing area?

According to the 1960 census the population of New England, New York and New Jersey was over 35,000,000. The 3 northern states of New England accounted for about 2 million; Massachusetts, Connecticut and Rhode Island had over 8 1/2 million, New York 16.8 million; New Jersey a little over 8 million people. This concentration of 18% of the total United States population is considered to be the greatest market geographically of any similar area in the United States. If everyone in this 8 state area consumed approximately 1 bushel per person, all of the apples produced here would be marketed in the Northeast. However, we know that average per capita consumption of apples in all forms is about 30 pounds. At least, this is the available supply per person. We also know that many apples from other areas are marketed in the Northeast.

To balance our supply of apples against the potential home market, let us assume:

1. That the average per capita is 30 lbs. per year

2. That outside apples do not come into our markets

3. That the average production from 1948 to 1962 is a fair average of our supply.

Then we would find that Maine, New Hampshire and Vermont with a total population of under 2 million produce 4,278,000 bushels of apples. The people in this 3 state area apparently consume 1,473,000 bushels, leaving 2,805,000 bushels to be marketed elsewhere.

On the other hand, Massachusetts, Connecticut and Rhode Island with a population of 8 1/2 million produce 4,228,000 bushels or over 2,000,000

short of consumer needs. Balancing out the figures for New England, we find about 600,000 bushels more than the area can consume at the 30 lbs. rate.

New York, with a population of 16.8 million and an average production of 21,000,000 bushels, has 8 1/2 million more bushels than can be consumed in the State. On the other hand, New Jersey needs 2 1/2 million bushels more to meet the supply required at 30 lbs. per capita. Therefore, the 8 state area produces about 6 1/2 million more bushels than will be consumed by the population in this area. This quantity represents about 20% of the average crop and we must remember that it is based on the assumption that no other supplies come in from the outside.

How big a market do we need for 6 1/2 million boxes of apples? This represents about 8,200 car loads (800 bu. per), which would supply a market the size of Boston for 8 months. Perhaps this partly explains why we are in markets such as Miami, Tampa, Washington, D. C., Philadelphia, Cleveland and other points west.

Creating Demands for Apples

Assuming that more apples can be consumed in New England and New York, where would we expect it to occur? Before finding an answer, I believe we have to re-state our over-simplified statistical finding "that 30 lbs. is the average per capita consumption for apples". This is not a measure of demand for apples. It is simply a statistic; therefore, we may assume that:

Some people eat more than 30 lbs. per year
Some people do not eat apples
Some people use only apple products
Some people know all about apples
Some people seldom see them.

Perhaps we can assume that farm people do consume more than city people. It may be that there are far more people who know less about apples today than ever before. Basing this on the facts of the population explosion and the decrease in farm population, this assumption has some validity.

To increase demand for apples, it appears to me that we need to reach consumers in the large urban and metropolitan areas. None of these areas are in the 3 northern New England States. For instance, metropolitan Boston has more people than all of Maine, Vermont and New Hampshire combined.

Two cities, Hartford and New Britain, Conn., have more people than the State of New Hampshire.

The metropolitan area of Springfield, Chicopee and Holyoke has 100,000 more people than all of Vermont.

More than 60% of the New York State population lives in metropolitan New York City (10.7 million).

Creating apple demand in these concentrated areas of population requires planned programs with sufficient support to carry through to the consumers. There are several approaches, none of which can be entirely successful without strong industry support. Education is one approach. It is needed to tell school children about apples. The effectiveness is long-range, but much needed because more and more children are growing up today without ever standing in the shade of an apple tree.

Promotion and publicity -- another form of education -- is needed to alert the consumers about apples and the availability of apples. Through advertising by way of newspapers, radio and television, we reach consumers at specified times. Advertising as a "salesman's helper" can be geared to promoting a specific variety at a particular period in selected markets. For instance, 3 radio stations in Springfield, Mass. would reach far more people in one week than all radio stations in Vermont and at far less cost per listener.

To reach the ultimate consumer of your product, we must start with an idea. Consumers must be sold an idea. It might be that "apples are great for snacks" or more specifically "McIntosh are great for snacks". If the consumer accepts this idea and buys McIntosh apples, somebody has made a sale.

****

WHEN SHOULD PEACH TREES BE PRUNED?

William J. Lord
Department of Plant and Soil Sciences

It is generally stated that peach trees should be pruned in the latter part of February or in March, after the danger of extremely low winter temperatures has ceased. Quite often, however, growers prune their peach trees during bloom. This may be done because weather conditions or other work delay pruning till past the dormant season. Also, some growers delay pruning in order to observe the extent of winter injury to buds before pruning. The question arises as to how late in the spring, pruning may be done without reducing the amount and quality of the fruit, or the growth of the trees.

The experiment conducted by the late Dr. A. Leon Havis, Plant Industry Station, Beltsville, Maryland, entitled "Pruning Peach Trees at Different Periods in the Spring" gives some interesting information concerning the comparative effect of pruning in the dormant season, at different periods in the spring, and of no pruning at all.

The trees used for the pruning tests were 12-year-old Elberta trees which had been pruned uniformly previous to the experiment. Fifty trees of uniform size, vigor, potential yield, and previous crop and growth records, were selected. Ten trees were used for each of the periods of pruning: dormant, full bloom, shuck fall, 3 weeks after shuck fall and no pruning. The tests were conducted over a 5 year period.

The results obtained by Dr. Havis show several advantages of pruning during the dormant season. The yield of dormant-pruned trees was higher than that on those pruned at full bloom, shuck fall, or 3 weeks after shuck fall. Yields of dormant-pruned trees in comparison to those not pruned were about the same, but the fruit was larger on the dormant-pruned trees. Fruits from the unpruned trees were significantly smaller than those from the trees receiving the pruning treatments. The largest fruits were produced by the trees pruned latest in the season, since relatively few fruits per tree remained as a result of the heavy drop of flowers and fruits under this treatment.

Fruits produced on trees pruned at full bloom or at shuck fall or left unpruned, matured earlier than the ones produced on the dormant-pruned trees and those pruned 3 weeks after shuck fall.

The longest shoot growth was produced by the dormant-pruned trees. But no significant difference in shoot length occurred among the trees pruned at full bloom, at shuck fall, or three weeks after shuck fall, although the trend was toward shorter growth as pruning was delayed. Shoot growth on the unpruned trees was considerably less than with any other treatment.

The largest number of flower buds per foot of shoot length was produced by the dormant-pruned trees. The next largest number was produced on trees pruned at full bloom. No significant difference in the number of flower buds per foot of shoot-length, occurred among the trees pruned at shuck fall, or three weeks after shuck fall, or those that received no pruning.

The data obtained by Havis indicate that from the standpoint of shoot growth and fruit size, it is advisable to prune even as late as 3 weeks after shuck fall, rather than not to prune at all.

The experiment cited above shows that in most instances growers should try to prune their peach trees during the dormant season. When winter injury has occurred to the buds, the degree of pruning should be decided upon after examining the flower buds or after forcing some branches. By following this procedure, the grower can determine the extent of winter injury to flower buds and prune accordingly, without having to wait until full bloom. If winter injury to the wood is evident, pruning should be delayed until the extent of the damage is known.

****

Pomological Paragraph

CA Storage Capacity

CA storage construction has been drastically reduced since 1961, with only 3 new rooms constructed and operated for the first time during the 1964-1965 storage season. Records kept by the Extension Pomologist indicate CA storage capacity for approximately 808,000 bushels in Massachusetts.

William J. Lord

****

DECOMPOSITION OF HERBICIDES IN SOILS

William J. Lord
Department of Plant and Soil Sciences

Fruit growers, like all individuals that use herbicides, are interested in the fate of these materials in soils. Considerable research has been conducted on the relation of decomposition to soil types, environment and chemical structure of some herbicides. These research findings have been reviewed by T. J. Sheets and his co-workers (T. J. Sheets --"Persistence of Herbicides in Soils"--Proc. W.W.C.C. 19: 37-42, 1962, and T. J. Sheets, C. I. Harris, D. D. Kaufman, and P. C. Kearney--"Fate of Herbicides in Soils"--Proc. N.E.W.C.C. 18: 21-31, 1964). Most of the information was taken from these articles.

> "The amount of soil water, the water solubility of herbicides, and the degree and tenacity of soil adsorption may have considerable influence on the persistence of herbicides. Most organic herbicides are leached more readily in sands and sandy loams than in clay loams, clays, and soils high in organic matter."

Because of this, the recommended dosage of herbicides is usually less for a sandy soil than for a clay soil.

Degradation by soil micro-organisms is one of the major pathways by which organic herbicides are detoxified. Most organic herbicides are inactivated most rapidly in soil under the conditions optimum for growth of micro-organisms.

> "Temperature, rainfall, wind, and sunlight affect the persistence of herbicides directly and indirectly through their effects on soil processes. Temperature affects vaporization, adsorption, chemical reactions, adsorption and metabolism by micro-organisms and higher plants, solubility, and leaching. In addition to directly causing movement and dilution in the

> soil, rainfall and irrigation supply water to the soil; and water is essential for the occurrence of many of the processes which promote the dissipation of herbicides from soils. Air movements influence vaporization and, therefore, loss of herbicides from soils."

Dr. Sheets, et. al. arbitrarily classified herbicides into four groups based on the time usually required for inactivation in soils:

(a) 0 to 3 weeks
(b) 3 to 12 weeks
(c) 3 to 12 months
(d) More than 12 months

These are arbitrary classifications, since many factors influence the decomposition of herbicides and therefore a herbicide may fit more than one group.

Herbicides that are usually inactivated within 3 weeks, which are of interest to fruit growers, are amitrole and dalapon. Both of these materials are labeled for use in apple orchards.

Simazine and diuron, which are in frequent use in our orchards, generally are inactivated between 3 and 12 months. Under some environmental conditions, diuron and simazine have persisted more than a year, however.

> "When organic herbicides applied at recommended rates for selective weed control in crops have persisted for 1 year, the concentration in the soil has been very low at the end of the year."

****

FRUIT NOTES

Prepared by Pomology Staff, Department of Horticulture
Cooperative Extension Service, College of Agriculture
University of Massachusetts, Amherst

MARCH 15, 1965

TABLE OF CONTENTS

Issued by the Cooperative Extension Service, A. A. Spielman, Dean and Director, in furtherance of the Acts of May 8 and June 30, 1914.
University of Massachusetts, United States Department of Agriculture and County Extension Services cooperating.
Publication Approved by Alfred C. Holland, State Purchasing Agent, No. 44.

FOLIAR CALCIUM SPRAYS REDUCE APPLE BITTER PIT

Mack Drake, W. D. Weeks, J. H. Baker, D. L. Field and G. W. Olanyk[1]

Bitter Pit disorder of apples was recorded in Germany in 1829 and 1862, and was officially recognized in Australia in 1892. Bitter pit (also called stippen, Baldwin spot, or fruit spot) occurs where apples are grown throughout the world - Europe, Australia, New Zealand, South Africa, Japan, Northeastern U.S.A. and Canada, etc. Some of the more susceptible varieties are Baldwin, Northern Spy, and Cortland in Northeastern U.S.A. and Canada; Golden Delicious, Red Delicious, Starking, Jonathan, Winter Pearman in South Africa; Sturmer, Cox's Orange Pippin and Cleopatra in Australia and New Zealand.

Physical Characteristics of Bitter Pit

South African scientists divide bitter pit into "tree pit" and "storage or store pit", which is reduced by calcium foliar sprays, and "confluent pit" found in fruit at harvest - this latter was not reduced by calcium sprays. It is thought that pitting is induced in the orchard, but in some cases it may not develop until the fruit is in storage. Maximum storage pit developed in Australia and South Africa when fruit from susceptible trees was picked 2 to 3 weeks early - before the disorder had fully developed on the fruit. Often it is a hidden disease because fruit free of pit at harvest may develop pits during storage. Bitter pit, not to be confused with internal corky abnormalities, such as boron deficiency - is characterized by brown depressed spots approximately 0.2 inches in diameter in the fruit flesh immediately under the skin. In the most susceptible varieties, a greater number of spots appear near the calyx end.

Smock, in New York, stated that in early stage of development, groups of cell walls beneath the inner skin (hypodermal) of the fruit collapse. Initially, neither the inner (hypodermis) nor the outer skin (epidermis) are affected, but in advanced development, the walls collapse and become torn. With the collapse of large areas of fleshy tissue just beneath the surface, both inner and outer skin tissues become distorted, are depressed and turn brown or black (Figure 1), spoiling the apple's appearance. The pitted areas are not removed by automatic peelers in processing, and apples with the bitter pit disorder are not acceptable in the better grades of fruit.

Value of Balanced Mineral Nutrition. A high level of nitrogen, low calcium, small crop set, large fruit size, heavy pruning and moisture stress, are reported to increase the fruit's susceptibility to bitter pit. Research during the past decade shows that bitter pit development is related to low calcium content of leaf or fruit. Martin, from Australia, reports nearly twice as much calcium per cell for sound as for pitted fruit. Kidson and coworkers, in New Zealand, show that the cal-

[1]Professor, Associate Professor, Assistant Professor and Technical Assistants, Department of Plant and Soil Sciences, University of Massachusetts, Amherst.

cium content of the skin from normal apples is double that of pitted fruit and in several cases the magnesium is higher in the skin of pitted than in normal fruit. Recent evidence indicates it is not simply the level of calcium, but the relative balance of calcium to nitrogen, to magnesium, to potassium and to boron which must be considered. For example: Yamazaki and Mori, from Japan, show that bitter pit in Jonathan apples occurred when calcium was absent from the nutrient solution and that it was increased by added nitrogen at each of 3 levels of calcium nutrition. Rose et al, of the U.S.D.A., reports that adding magnesium (Epsom salts) to irrigation water produces symptoms similar to Baldwin spot, indicating the importance of the calcium-magnesium ratio in apple nutrition. Garman and Mathis, at the New Haven Experiment Station in Connecticut, reduced bitter pit by injecting a calcium salt solution through the calyx-end while the apple was growing on the tree, and induced bitter pit by injecting a magnesium solution. They report that the magnesium to calcium ratio was 4 to 1 in pitted and 1 to 1 in normal fruit. Baxter, in Australia, reported that this disorder can be artificially induced by a calcium deficiency brought about by spraying the leaves with a magnesium salt solution or by injecting calcium chelating agents.

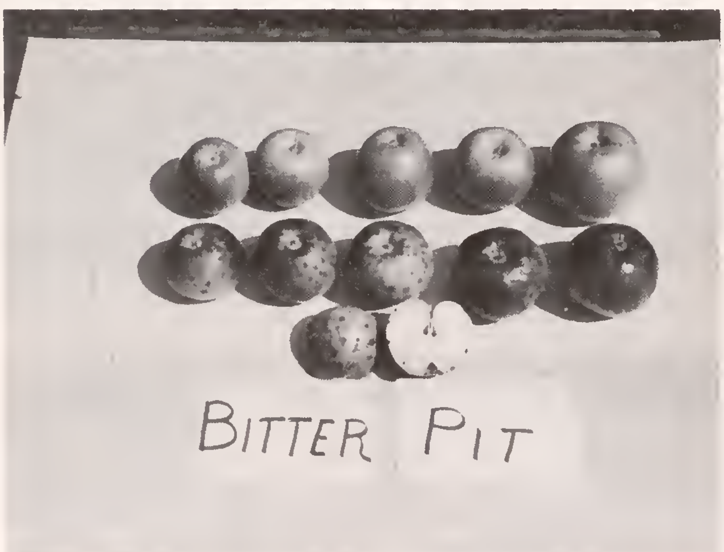


Fig. 1. Bitter pit on Baldwin apples. The top row of apples show only a slight indication of the disorder; whereas, the remainder of the fruit are severely pitted.

Cation Balance. The sum of the nutrient cations (calcium + potassium + magnesium) in tissue of a given plant species tends to be a constant. Leaf potassium is higher and calcium and magnesium are lower with a light as compared to heavy crop. Thus, if leaf potassium is increased by fertilizer application or by crop size, calcium and magnesium will be depressed. If leaf potassium is low, calcium and magnesium will be relatively high. Likewise, increasing the level of magnesium in the leaf, reduces calcium and potassium, while in contrast increasing leaf calcium reduces magnesium and potassium. Although, leaf calcium usually is low for those trees with pitted fruit, Massachusetts research shows that for a given calcium level in the leaf, a greater incidence of bitter pit is associated with a relatively high leaf magnesium or potassium level. This illustrates the importance of maintaining a desirable balance of the nutrient cations, calcium, potassium and magnesium, in the leaf tissue. Because calcium moves slowly into the soil and through the conducting tissue of the tree, foliar fertilization by spraying with calcium salt solutions, is required to raise the level of calcium quickly in the apple leaf and conducting tissue. Garman and Mathis compared

apple leaf and fruit analysis of 9 trees on August 17 and on October 1, and found over a 50% reduction in fruit calcium, and a 30% gain in leaf calcium by October 1. They reasoned that leaf calcium was increasing at the expense of fruit calcium and proposed late summer foliar calcium applications. Competition by the leaf with the apple fruit for calcium has been suggested as one reason for greater incidence of bitter pit with a small crop, since in these light crop years, there is relatively greater shoot and leaf development.

Reduction of Bitter Pit

Incidence of bitter pit has been reduced greatly by the foliar application of calcium solutions on trees with a history of producing pitted fruit. Garman and Mathis, in Connecticut, U.S.A., Ginsburg and Beyers, in South Africa, Jackson, and Kidson and coworkers in New Zealand, Martin, et al in Australia, Yamazaki et al in Japan, and Smock and others have made major research contributions in this area. In South Africa, Ginsburg and Beyers reported that 3 spray applications of 1 per cent solution of calcium nitrate (8 pounds/100 gal. water), beginning about 2 weeks after bloom and repeated at 2 week intervals, reduced bitter pit from 20 to 2 per cent.

Solutions of either calcium nitrate or calcium chloride have been effective in reducing bitter pit. The Japanese have demonstrated that incidence of bitter pit was increased by nitrogen. Thus, in theory, calcium nitrate, by supplying foliar nitrogen, would be somewhat less effective than calcium chloride in reducing bitter pit. However, observations by Dillon in Australia, at the Massachusetts Experiment Station and elsewhere, indicate that the use of calcium chloride is more likely to result in injury to the leaf margin or leaf scorch. When foliar applications of calcium nitrate are used, corresponding reductions in fertilizer nitrogen applications should be scheduled.

Growers who are interested in applying calcium foliar sprays may obtain recommendations from Dr. W. J. Lord, Extension Pomologist, University of Massachusetts, Amherst, Mass.

****

POMOLOGICAL PARAGRAPH

Sources of Nitrogen - In the 93rd Annual Report of the State Horticultural Society of Michigan, A. L. Kenworthy stated that recent research has shown that there are no obvious differences in the effect of various nitrogen sources on fruit trees. This gives support to our statement that it is the amount of actual nitrogen applied that is important and not the source, therefore, the selection should be based on cost.

****

RESULTS OF LEAF ANALYSES

William J. Lord and Bertram Gersten, Control Service

Maintaining the desired nutritional level of fruit trees is a difficult task because of crop size, pruning, weather and tree-to-tree variation. However, through leaf analyses, careful observations, some differential fertilization and use of a foliar application of urea on weaker trees, you can at least partially solve the problem.

Leaf analyses have shown that low potassium levels have been prevalent for the last 2 years. We know that leaf potassium is generally lower in dry growing seasons than in years with adequate soil moisture. However, not all trees sampled were low in potassium and some of these trees with adequate potassium were located on lighter soils. It would appear, therefore, that low potassium levels weren't entirely due to the dry growing season, and the rate of application should be increased in some orchards.

For the last several years, a number of growers have omitted or reduced nitrogen applications in order to increase fruit firmness and color. Analyses of leaves obtained from commercial orchards during the past 2 summers, indicate that the rate of nitrogen application should be increased in some orchards. At the time of sampling, we observed that many of the McIntosh trees were low in vigor. Terminal growth was less than 6 inches on some trees.

****

VIRUS-FREE RED RASPBERRY PLANTS

William J. Lord
Department of Plant and Soil Sciences

The USDA has released for multiplication by nurseries, virus-free stocks of Amber, Canby, Cuthbert, Fairview, Latham, Marcy, New Hampshire, Newburgh, Puyallup, September, Sunrise, Taylor, Viking, and Washington, varieties of red raspberries.

Correspondence with nurseries having these mosaic virus-free stock, indicates that only a very limited supply of these is available for sale in 1965. It will be a year or 2 before anything but a limited number of virus-free plants will be available.

The January 1965, issue of Agricultural Research reports that virus-free raspberry plants receiving regular insect control programs, remained relatively free from reinfection in the field for 2 years or more. This is a considerably longer period than had been anticipated.

Growers desiring to make inquiries about purchasing virus-free red raspberry plants, may write the Editor of Fruit Notes for the names of nurseries to contact.

****

SOME INSECT PESTS OF CULTIVATED BLUEBERRIES

William E. Tomlinson, Jr.
Cranberry Station, East Wareham

The different insects that are known to infest cultivated blueberries are quite numerous, but fortunately only a few are of enough importance to require the use of pesticides. The important ones in Massachusetts have been cranberry weevil, cranberry fruitworm, cherry fruitworm, blueberry maggot, and Japanese beetle. Several others are occasionally troublesome.

Much future trouble from a few insects can be avoided by proper pruning. Stem galls should be removed and disposed of in such a manner that the gall-producing wasps they contain cannot emerge from the galls and infest new twig growth in the spring. The galls preferably should be burned, or at least buried under several inches of soil. Canes infested with stem borers should be removed whenever noticed, regardless of the time of year, but during the pruning operation is an excellent time to be on the watch for signs of their activity. Orange-colored frass pellets under an infested cane indicate an active borer. Be sure to remove the cane below where it is tunnelled and probe for any tunnels in the crown with a twig or wire if they have worked that far down in the bush. Though not an entirely reliable scale insect control, regular removal of older, less productive canes low in the crown, is helpful in retarding the development of serious scale insect infestations. When scales do become abundant, a thorough spraying with superior oil in the dormant season is a dependable control.

On quiet, warm, sunny days in the spring, after the fruit buds swell but before bloom has opened, is the time to be on the alert for cranberry weevil, especially on bushes around the edges of the field. An occasional one can be ignored, but if they occur several to the bush, the field should be treated. The weevils lay eggs in the unopened blossoms and the developing larvae feed on the flower parts, one larva per blossom. Because of their small size and earliness in the season, they may go undetected for several seasons, with the result that they build up to outbreak numbers, and the small crops that result may be attributed to some other cause, such as frost or lack of pollination.

After the blossoms have set, the small green fruit is subject to the attack of several different species of insect larvae. Two are of very little importance, though they account for a few less fruit almost every season. The grub of the plum curculio is the first of these, its presence being indicated by a crescent-shaped scar on the berry. A few are noted almost every year in Massachusetts, but in North Carolina this is a major blueberry pest.

Another minor pest is the maggot of a small fly that develops in the green fruit. At picking time these appear as ripe berries, except for a small green circular area on one side of a berry that hasn't ripened normally due to the feeding and secretions of the maggot of this midge. A

few are seen almost every year, but never in my experience have they been seen in numbers that warrant control measures, even if we had any.

Another "worm" is the grub of a small weevil known as the currant fruit weevil. This is usually a minor pest, but has been the cause of serious crop loss in at least one Massachusetts field. The beetle lays her egg in the berry stem or in the berry close to the stem, and the grub works into the green berry and feeds therein. Infested berries color prematurely and are small and shrivelled. They may get into the first picking, but generally they have been knocked off or have dropped off by the time of later pickings. In the usual light infestation, malathion or carbaryl as recommended for the next two pest should keep it from building up to serious proportions.

The two most important green fruit pests throughout the range of the cultivated blueberry are the cranberry fruitworm and the cherry fruitworm. These are the culprits that like to wander around in the package under the cellophane and make you wish you were in some other business at times.

Cranberry fruitworm is the more obvious of the two because of the frassy web it makes as it feeds in a cluster of berries. Each worm may destroy half a dozen or more berries before it finishes feeding. The caterpillar is green until nearly mature when it takes on a reddish brown tinge on the back and sides. It is about 1/2 inch long when mature. When through feeding it drops to the ground and spins a hiburnaculum of web and sand, where it remains until the following spring when it transforms to an adult and starts another infestation.

The cherry fruitworm feeds in a manner similar to the cranberry fruitworm, but it does not make a web. Often the first indication of its presence is the appearance of prematurely-coloring fruit. The number of berries each larva feeds in is not known, but is probably somewhat less than is the case of cranberry fruitworm. Don't let that mislead you, as they can make up in numbers for their smaller size and appetite. As many as 75 have emerged from a pint, and 2 to 3 dozen per pint is not uncommon in a moderate to heavy infestation. The worm or caterpillar is a bright orange-red color and is about 1/3 of an inch long when full grown. It has the habit, when finished feeding, of boring into old pruning stubs or scars on the bush where it spends its life until the following season, when it transform to a moth to start the trouble all over again.

Control of these 2 pests is obtained with timely applications of carbaryl or malathion. If both are present in damaging numbers, 3 applications may be needed, but usually 2 are all that are required. The first application should go on toward the close of bloom (75% set) of early varieties, and a second application 10 days later. A third application a week after the second may be worthwhile in a heavy cherry fruitworm infestation.

The last, but by no means least important, of the blueberry "worms" is blueberry maggot. This past summer saw it more abundant than usual

throughout the area, with fly counts on my sticky traps running 2-4 times higher than for several years.

This is a pest of ripe fruit, though some seasons if flies emerge early, eggs are deposited in green fruit. However, they don't mature until after this fruit is ripe. Because of a long fly emergence period, as well as fly migration, they can and do cause trouble throughout the picking season.

To control, apply carbaryl or malathion at 7 to 10-day intervals, starting when the first few normal berries turn blue. Picking bushes clean and regularly helps keep this pest from having a chance to develop into a serious infestation.

In those areas where Japanese beetles are numerous, it is a very serious pest of cultivated blueberries because of its fondness for ripening berries and tender foliage. On warm, sunny days, they congregate in large numbers on the top berry clusters and seriously damage the crop by their scoring of berries. Carbaryl gives outstanding control of this pest, therefore, in those areas where Japanese beetles as well as maggot are a problem, carbaryl is the first recommendation for control of these two pests.

In addition to these, fall webworms and Datana worms, which feed in groups and sometimes defoliate individual bushes, cause some concern at times. Also, several sucking insects, such as heath spittlebug, plant bugs and leafhoppers are minor drains on the bushes, and the sharp-nosed leafhopper has the added distinction of spreading the stunt disease virus of blueberry. All of these lesser pests are controlled by the controls aimed at the more serious pests, such as fruitworm and maggot.

****

MACS MUST BE KEPT COLD

William J. Bramlage
Department of Plant and Soil Sciences

As a part of a larger experiment conducted in our storages in Amherst, we compared the storage life of McIntosh apples held in 2 different regular air storages. Both of these storages were set to maintain a temperature of about 32^{o}F. However, one room had an excellent temperature control system and averaged 32.4^{o}F. over a 3-month period, while the other room had a poor temperature control system and averaged 34.5^{o}F. in the morning during the 3-month period. Furthermore, the temperature in the poorly controlled room rose to 38-40^{o} 3 times a week during an afternoon defrosting cycle. The behavior of the apples in these 2 rooms illustrated strikingly the necessity of a good temperature control system.

In Table 1 are shown the flesh firmness readings on the fruit when removed from the 2 rooms. The apples from the poorly-controlled room

were as soft, after only 63 days of storage, as were those from the well-controlled room after 113 days of storage. Thus, only a couple degrees increase of the storage temperature shortened the storage life of the apples by 50 days.

Table 1. Firmness (lbs. pressure) of McIntosh apples when removed from storage.

Storage temperature (^{o}F.)	Days in storage 0	63	84	91	103	113
32.4	15.5	12.5	11.5	11.4	10.5	10.6
34.5	15.5	10.5	9.6	9.7	8.9	9.0

When the apples were held at room temperature for 7 and 14 days after removal from storage, the rate of softening continued to show the 50-day differential between the 2 rooms (Table 2). The apples from the warmer room were as soft after 63 days as were those from the colder room after 113 days, after both 7 and 14 days at 70-75^{o}. The quality of the fruits from the 2 rooms was very noticeably different. At every examination, the fruits from the poorly-regulated room were distinctly softer in texture. Also, after storage for 84-113 days, the apples from the poorly-regulated room were yellower than the others.

Table 2. Firmness (lbs. pressure) of McIntosh apples held at 70-75^{o}F. after removal from storage.

Days at 70-75^{o}F.	Storage temperature (^{o}F.)	Days in storage 63	84	91	103	113
7	32.4	9.4	9.7	9.3	9.2	8.3
	34.5	8.8	8.5	8.1	8.3	7.6
14	32.4	8.7	8.6	8.4	8.6	8.2
	34.5	7.9	7.6	7.4	7.1	7.2

These results show the absolute necessity of maintaining the storage temperature very near to 32^{o} for McIntosh apples, if you are to market good fruits out of regular air storage. If your storage is operating only a couple of degrees above 32^{o}, you may be reducing drastically the storage life of McIntosh apples.

****

SPRAY MATERIALS ARE DANGEROUS IN FIRES!

William J. Lord
Department of Plant and Soil Science

Firemen were hospitalized due to inhalation of phosphate fumes and smoke while fighting recent fires on two fruit farms.

Hospital attendants failed to recognize phosphate poisoning and the firemen were treated for smoke inhalation.

Fortunately, the fire commissioner brought to the hospital, a copy of an Extension Service Letter, which described phosphate poisoning and proper atropine treatment.

Otherwise, some firemen may have died.

The above happened in Monroe County, New York ("Dangers to Firemen When Spray Materials Burn" by Richard Norton, Monroe County Fruit Agent - January issue of New York State Horticultural Society News Letter).

It Could Have Happened in Massachusetts!

Here are some recommended steps for preventing it from happening:

1. Inform your fire department officials of the chemical storage and its contents before the emergency.
2. Store the chemicals in one place, preferably in a structure separated from other buildings.
3. Keep all chemical-containing buildings locked and inaccessible to children and irresponsible persons.
4. Label all buildings containing chemicals as to their contents.
5. The list of Poison Information Centers should be posted in a conspicuous place, and make its presence known to the members of your family and all employees.

PESTICIDE SAFETY IS YOUR RESPONSIBILITY

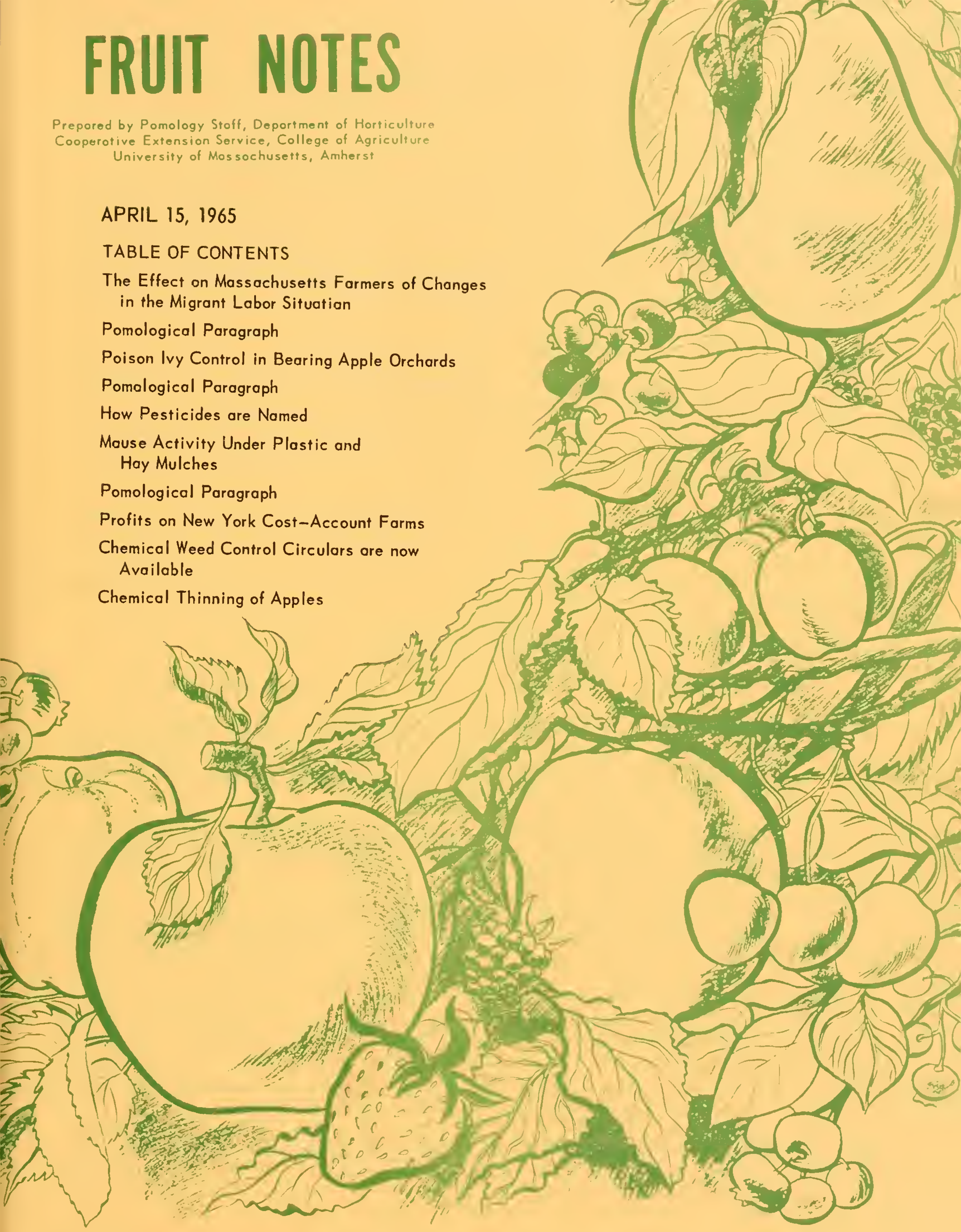
****

FRUIT NOTES

Prepared by Pomology Staff, Department of Horticulture
Cooperative Extension Service, College of Agriculture
University of Massachusetts, Amherst

APRIL 15, 1965

TABLE OF CONTENTS



Issued by the Cooperative Extension Service, A. A. Spielman, Dean and Director, in furtherance of the Acts of May 8 and June 30, 1914, University of Massachusetts, United States Department of Agriculture and County Extension Services cooperating.
Publication Approved by Alfred C. Holland, State Purchasing Agent, No. 44.

THE EFFECT ON MASSACHUSETTS FARMERS OF CHANGES IN THE MIGRANT LABOR SITUATION

Earl I. Fuller and Lawrence D. Rhoades
Department of Agriculture and Food Economics

Federal regulation now requires the payment of $1.30 an hour minimum to all farm workers on Massachusetts farms hiring foreign nationals. British West Indians and Jamaicans as well as the Mexican Bracero are foreign nationals. Puerto Ricans are not. The same wage rate will prevail in New York, New Jersey, Rhode Island and New Hampshire. Connecticut farmers must pay $1.40 per hour.

These pay scales are only one indication of some nationwide trends:

1. The Mexican Bracero workers are apparently going to be unavailable in competing vegetable and fruit areas.

2. A national minimum wage law is likely within the next 5 years. Many states already have them.

3. Labor unions are still active in attempting to organize farm workers.

These are factors that managers in the fruit and vegetable business will have to consider in years ahead.

SHORT RUN EFFECTS

Several things are likely to happen in the immediate future:

1. Reductions in crops such as celery, melons, and strawberries are likely to occur on the West Coast or wherever these higher labor-requiring type crops are grown and where the producer now relies heavily on foreign labor.

2. Producers in the same situation are likely to shift to low labor-requiring crops such as onions and potatoes. These are crops that are now highly mechanized.

3. The pressure to develop mechanical harvesting techniques will increase. Remember that there is no crop that cannot be harvested mechanically if enough research and time is spent on the problem.

4. Mexico and Canada will continue to grow in vegetable and fruit production.

5. There should be higher prices for higher labor-requiring crops, but lower prices for low labor-requiring crops.

6. The small growers supplying most of their own labor from the family could benefit in the short run.

LONG RUN EFFECTS

It takes time for a change like this to work itself out in the economy. As it does some trends should be evident:

1. The relative advantage of the production of crops for processing as compared to the fresh market shift in favor of processing. The reasoning behind this is as follows: Quality requirements are lower for processing. Mechanization can proceed more rapidly. Continued hand labor required for fresh market production will increase cost and then market price. Consumers will tend to shift some of their preference towards the processed, and lower cost, form of the product.

2. The usual effect of increased mechanization in a business is increased overhead. For mechanization to be economical will require an increase in the size of the business.

3. Small growers will have to:

    a. Accept lower net returns;

    b. Quit the business;

    c. Grow in size;

    d. Intensify efforts to develop a speciality (higher priced) market and consequently take on more of the marketing functions.

4. Areas of the country that have terrain suitable for mechanization will have an advantage.

MANAGERS CREATE CHANGE AS WELL AS ADJUST TO IT

But which soils, climates, and market situations will enjoy long run advantages is never clear. Where and by whom new varieties and machines are invented will have a great deal to do with the production side. Marketing patterns don't just happen, either. Market relationships involve managers making decisions and sound sales efforts have their effect. It will take group action on the part of Massachusetts growers to gain advantages here.

On an individual farm basis, growers can take advantage of these trends by moving with them or ahead of them in many instances. Shifts in crops, or shifts in labor supply may be in order. But don't forget the market. Because of it, there may be times when you can move counter to the trend.

Fruit and vegetable production in Massachusetts has remained remarkably stable over many, many years. Managers have made these kinds of adjustments many, many times.

****

POMOLOGICAL PARAGRAPH

Spencer Apple - The few growers who have fruited Spencer report good acceptance of this variety at roadside stands. The high quality of Spencer apparently will bring repeat customers for the variety.

****

POISON IVY CONTROL IN BEARING APPLE ORCHARDS

William J. Lord
Department of Plant and Soil Sciences

Amizine and amitrole-T (commercial product Amitrol-T) are labeled for use in bearing apple orchards but they may be used only prior to fruit set or after harvest. With this timing, however, only partial control of poison ivy can be obtained, because the herbicide must be applied to leaves.

At full bloom of apple trees, many poison ivy stems have not produced foliage; therefore, treatments applied at this time fail to give satisfactory results. For example, in 1962 and 1963 only 41% and 26%, respectively, of the poison ivy was killed by sprays applied at full bloom. Since the amount of foliage present on poison ivy stems at full bloom of apple trees varies from orchard to orchard and from tree to tree, the effectiveness of sprays for poison ivy control may be quite variable.

However, applications of amizine or amitrole-T repeated yearly show promise for the gradual elimination of poison ivy. Retreatment in 1964 of the plots sprayed in 1963, increased the control of poison ivy from 26% to 86%.

The timing problem may now be lessened slightly because "Prior to Fruit Set" is now defined as meaning an application must be applied before 90% of the apple petals have fallen. This means that spray applications of amizine or amitrole-T may be made after the full bloom period and that leaf development on poison ivy will be more advanced.

Post-Harvest Treatments Under Bearing Trees

The usefulness of amizine or amitrole-T as post-harvest sprays appears dependent upon the presence of a full complement of leaves on the poison ivy stems. Treatments applied on September 27, 1961, while the foliage was still green, gave 99% control. Sprays applied on October 11, 1961, when foliage showed fall coloration, gave 90% poison ivy control. Treatments applied on October 11, 1962, when the poison ivy stems were partly defoliated, gave an average control of only 10%.

Amizine or amitrole-T sprays applied soon after harvest of varieties maturing prior to McIntosh, would generally precede frosts and should

give satisfactory poison ivy control. The effectiveness of these herbicides for poison ivy control under trees of McIntosh harvest season and later would be dependent on the earliness and severity of frost and its effect on the poison ivy foliage.

****

POMOLOGICAL PARAGRAPH

Double Heading - Double heading of apple trees the year of planting appears to be gaining grower acceptance. One method of double heading is to prune the one-year-old whips 4-6 inches higher than desired at time of planting. When the top-most shoots are 4 to 6 inches long (generally in early June), the leader is cut back an additional 4 or 5 inches. This will eliminate limbs with sharp crotch angles in the upper part of the tree and force out more wide-angled side branches.

Some growers prefer to head the one-year-old whip to the desired height at planting. Then after the top-most shoots on the leader are 4-6 inches long, all are removed except for the one most suitable for the leader.

****

HOW PESTICIDES ARE NAMED

E. H. Wheeler, Professor of Entomology
Department of Entomology and Plant Pathology

Carbaryl is the common or generic name now being widely used for Sevin insecticide. Carbaryl will be used to designate this particular active ingredient on labels. Many growers who are seeing the new term, carbaryl, listed in state recommendations for insecticide treatments may wonder what this name means. By knowing this, mistakes may be avoided.

The common name for Sevin has been accepted by the International Organization for Standardization, the American Standards Association and the British Standards Institution.

Common names are adopted to clarify and standardize the nomenclature of a product throughout the world. Governmental and scientific groups can more readily use a generic or common name of a material in recommendations and communications without sponsoring or favoring a particular trade-marked brand name.

Why carbaryl? Sevin insecticide can be described chemically as a carbamate compound or an aryl urethane. Dr. Maurie Semel, of the New York Vegetable Research Station, Long Island, suggested combining the terms carbamate and aryl into "carbaryl" as a descriptive common name.

The trade mark, Sevin, was selected by Union Carbide Corporation because more than 7,000 compounds were screened before the product was discovered. Sevin actually was compound No. 7,744. Company scientists began calling it "Seven". The word was deliberately misspelled as "Sevin" in order to register it as a trade name. Its chemical name is 1-naphthyl N-methylcarbamate.

****

MOUSE ACTIVITY UNDER PLASTIC AND HAY MULCHES

John W. Peterson, District Agent
U. S. Fish and Wildlife Service
Amherst, Massachusetts

Since the advent of plastic, there has been a question as to its value as a mulch under young fruit trees. Of particular concern is its attraction or repellency to mice. Therefore, studies were conducted in 1963 and 1964 in cooperation with Extension Pomologist William J. Lord and Regional Agricultural Agent G. Everett Wilder to evaluate mouse activity under hay- and plastic-mulched trees and under those having the vegetation controlled by herbicides. Tests were conducted in Abner Peck and Sons' orchard in Shelburne, Massachusetts. The data collected during the 1963 test was considered invalid because there was a low mouse population in the area selected, making it difficult to measure differences in mouse activity. Hence, it was decided that another test would be carried out in 1964

The 1964 tests showed no significant difference in mouse activity under trees mulched with hay or black plastic. The presence or absence of simazine around tree bases showed no attraction or repellency to mice. From the standpoint of orchard mouse control, it is better to have no cover around the tree bases, as indicated by the fact that where the vegetation was controlled with simazine, no mouse activity was apparent.

****

POMOLOGICAL PARAGRAPH

Hardware Cloth Guards - A grower reports that his carton stapler is useful for stapling together hardware cloth wire guards used for mouse protection. Generally, 4 staples are used on each 24 inch high guard. The guards, which are prepared on a rainy day, are ready for placement around the newly planted apple whips. Naturally, it would usually be impossible to slip the guards down the stems of older trees.

****

PROFITS ON NEW YORK COST-ACCOUNT FARMS

William J. Lord
Department of Plant and Soil Sciences

Data presented by Del Kearl, Agricultural Economics Department, Cornell University, in the November, 1964, issue of the New York State Horticultural Society News-Letter, show that in general, fruit enterprises have been more profitable than the crops and livestock enterprises.

With the exception of a few years such as 1959, apple growing has been profitable and returned well over a dollar, for each dollar invested (Table 1).

Table 1.

RETURN PER DOLLAR OF COST FOR TREE FRUIT
Cost-Account Farms in New York

				Cherries		
Period	Apples	Peaches	Pears	Sweet		Sour
1919-23	$1.15*					
1924-28	1.41					
1929-33	1.15	$1.14[1]	$0.96[1]		$1.68**	
1934-38	1.14	1.34	1.05		1.79	
1939-43	1.27	1.44	1.65		1.60	
1944-48	1.33	1.53	1.11		2.10	
1949-53	1.24	0.99	1.45		1.35	
1954-58	1.16	0.73	2.07	$1.77		$1.03
1959	0.92	1.04	1.88	1.34		1.04
1960	1.37	0.95	1.93	1.85		1.10
1961	1.09	0.78	2.59	1.79		1.28
1962	1.23	0.84	3.04	1.69		0.96

*1920-23 [1]1930-33

**Before 1954 the cherries enterprise costs and returns were not kept separate.

It can be noted in the data presented by Del Kearl, that peaches, profitable in the thirties and forties, have returned less than cost since 1950. Pears, the other tree fruit of particular interest to Massachusetts growers have been very profitable in New York State in most years.

****

CHEMICAL WEED CONTROL CIRCULARS ARE NOW AVAILABLE

The 1965 Revision of Special Circular 215 entitled "Controlling Weeds in Small Fruit Plantings With Chemicals" and Special Circular 283 entitled "Chemical Weed Control Recommendations for Tree Fruits" are now available. Copies may be obtained through your County Extension Service or by writing to the Mailing Room, University of Massachusetts, Amherst, Massachusetts.

****

CHEMICAL THINNING OF APPLES

F. W. Southwick
Department of Plant and Soil Sciences

Chemical thinning has been discussed for a good many years in this publication and elsewhere, so I presume most fruit growers are aware that we have such satisfactory thinning materials as NAD (Amid-Thin), NAA (naphthaleneacetic acid) or its sodium salt, sold under a variety of labels and Carbaryl (Sevin). The details related to the use of these compounds for thinning most of our varieties are contained in Special Circular 189 which is available from the University of Massachusetts or from your Regional Fruit Specialist.

It is the intention here to show some recent data comparing several types of chemical thinning treatments, plus scoring, on "return" bloom of some very biennial varieties. Experimenters and growers have been generally successful in obtaining annual flowering of such varieties as McIntosh, Golden Delicious and Wealthy following the use of chemical thinners. However, it is much more difficult to obtain consistent annual flowering, even following heavy chemical thinning, on such varieties as Baldwin, Early McIntosh and Puritan. Consequently, we have emphasized in our recent work the relative effectiveness of different chemical thinners for stimulation of flowering. We have been interested, also, in what thinning treatments, if any, should be used once a moderate-to-heavy "return" bloom is obtained.

In Table 1 are some data obtained over a 2-year period on some Early McIntosh where scoring, in addition to the chemical thinning, was tried in 1963.

The data in Table 1 show quite clearly that "return" bloom in 1964 is primarily related to the degree of thinning in 1963. Sevin, which thinned slightly but significantly, improved fruit size somewhat, but the reduction in fruit set was so slight that those trees receiving two applications of Sevin (at petal fall and again 10 days later) in 1963 were barren, like the checks in 1964. Our attempts to improve the "return" bloom on these rather lightly thinned Sevin-treated trees by scoring (severingthe bark completely in 3 places - each ring of severed bark about 1/2 inch apart) about 4 weeks after full bloom also failed. Scoring increased "return" bloom in only one instance (Treatment 3).

Obviously, scoring is not as effective a treatment as substantial chemical thinning for inducing annual flowering of mature Early McIntosh trees. However, it may occasionally improve the amount of "return" bloom obtained if used as a supplement to chemical thinning.

Table 1. The influence of chemical thinning and scoring on fruit set, size and return bloom of Early McIntosh apples. 1963-64.

1963 Treatments[1]	Fruits/cm. of limb circumference	Avg. fruit diameter (inches)[2]	1964 Blossom clusters per cm. of limb circ.[3] Unscored	Scored
1. Check	19.9a[4]	2.11a	0.2a	0.2a
2. Sevin-3# (50% W.P.) NAD-50 ppm.	9.5c	2.32c	12.7c	13.7c
3. Sevin-3# (50% W.P.) NAA-20 ppm.	6.9d	2.41d	7.7b	15.4c
4. Sevin-3# (50% W.P.) Sevin-3# (50% W.P.)	15.9b	2.22b	0.1a	0.2a
5. NAD-50 ppm. NAA-20 ppm.	7.2cd	2.46cd	12.6c	13.1c

[1]Applied at petal-fall and 10 days after petal-fall, respectively. Six trees per treatment.

[2]Fruit size measurements made August 6, 1963 (60 fruits at random per tree) about 2 weeks before harvest commenced.

[3]All but one major limb per tree scored 3 times on June 13, 1963.

[4]Means followed by different letters are significantly different at the 5% level.

The question of whether or not a moderate or heavy "return" bloom should be chemically thinned is frequently asked. Until now, we've had very limited data on the subject, but it was our general observation that good "return" blooms on heavy-setting varieties like Early McIntosh usually require a continued chemical thinning treatment, otherwise over-setting and biennial bearing recur. Also, it has been observed that chemical thinners may be less effective in reducing fruit set on "return" blooming trees than they are on biennial trees in their "on" year. Table 2 provides some information on this subject.

Table 2. The influence of chemical thinning on fruit set and size of "Return" and "On" blooming Early McIntosh trees. 1964

1964 Treatments[1]	Applied[2]	Fruits per cm. of limb circumference	Avg. fruit diameter (inches)[3]
"Return" Bloom Trees			
1. Check		19.2a[4]	2.01a
2. Sevin-1# (50% W.P.)	PF		
NAD-50 ppm.	PF+13	8.0cd	2.15cd
3. NAD-50 ppm.	PF	13.9b	2.10bc
4. Sevin-1# (50% W.P.)	PF		
NAA-20 ppm.	PF+13	8.8c	2.24e
5. NAA-20 ppm.	PF+13	9.5c	2.17d
6. NAD-50 ppm.	PF+13	14.2b	2.07ab
"On" Bloom Trees			
7. Sevin-1# (50% W.P.)	PF		
NAA-20 ppm.	PF+13	5.7d	2.34f

[1]Five trees per treatment.

[2]PF=Petal-fall; PF+13=13 days after petal-fall.

[3]Fruit size measurements made August 7, 1964, (35 fruits at random per tree) about 2 weeks before harvest commenced.

[4]Means followed by different letters are significantly different at the 5% level.

From these data, it is evident that, when a relatively heavy "return" bloom is obtained on a heavy setting variety such as Early McIntosh, chemical thinning needs to be continued at essentially the same rate as for "on" trees. In fact, these data indicate that the "on" trees are easier to thin than the "return" blooming trees. Failure of fruit to size as well on the "return" blooming trees, even when well thinned, may be related to the two dry summers of 1963 and 1964, or to this factor plus the influence of two successive heavy crops on a normally biennial variety. The exhaustive effects of annual cropping may tend to reduce tree (including root) growth; consequently, the rate of fruit growth is less than that which occurs on trees bearing similar crops in alter-

nate years only. In addition, it should be remembered that scoring may have some deleterious effects if done annually, and it tends to increase the severity of Bitter Pit on susceptible varieties like Baldwin.

****

All pesticide chemicals mentioned in this publication are registered and cleared for the suggested uses in accordance with federal laws and regulations. Chapter 727, Acts of 1960, Commonwealth of Massachusetts requires that all pesticides sold in Massachusetts be registered with the Massachusetts Department of Public Health. Trade names, where used for clearness, do not indicate endorsement nor imply that similar products are not satisfactory.

WARNING! MOST PESTICIDES ARE POISONOUS. READ AND FOLLOW ALL DIRECTIONS AND SAFETY PRECAUTIONS ON LABELS. HANDLE CAREFULLY AND STORE OUT OF REACH OF CHILDREN, PETS AND LIVESTOCK.

FRUIT NOTES

Prepared by Pomology Staff, Department of Horticulture
Cooperative Extension Service, College of Agriculture
University of Massachusetts, Amherst

MAY 15, 1965

TABLE OF CONTENTS

Issued by the Cooperative Extension Service, A. A. Spielman, Dean and Director, in furtherance of the Acts of May 8 and June 30, 1914; University of Massachusetts, United States Department of Agriculture and County Extension Services cooperating. Publication Approved by Alfred C. Holland, State Purchasing Agent, No. 44.

GAMMA IRRADIATION OF FRESH FRUIT

William J. Bramlage
Department of Plant and Soil Sciences

When man learned to release the tremendous forces of atomic energy, his first use of that power was to build a bomb - the Atomic Bomb. But before the first bomb was exploded, he was already dreaming of harnessing these same atomic forces for peaceful uses.

Among the forces produced from radioactive materials are gamma rays. These are highly penetrating rays with the capacity to kill living cells of both plants and animals. Scientists soon learned to apply controlled doses of these gamma rays to kill unwanted or dangerous cells, and this is the basis for using radioactive materials to treat cancer patients. Similarly, attempts have been made to kill, through irradiation, the fungi and bacteria that cause decay of food. It is with this aspect of irradiation that we, as agriculturists, are personally concerned.

Much work has been done on food irradiation, and we frequently find articles in the newspapers and magazines giving glowing accounts of the use of these "magic rays" to preserve food indefinitely - without refrigeration. Indeed, there have been some notable successes: irradiated bacon, requiring no refrigeration, may soon be on the market; irradiated potatoes, that won't sprout, are now being sold in Canada; and research continues to look promising for retarding spoilage of fresh strawberries through irradiation. However, most of the press reports have been unduly optimistic, for food irradiation is beset with severe problems.

To sterilize a food product, that is, to kill <u>all</u> the bacteria and fungi on and in it, requires a massive dose of radiation. Such doses very often not only kill the microbes, but also cause severe changes in the foods, for example, changes in the color, taste, odor, or texture of the food. Dreams of replacing canning and refrigeration with irradiation have been largely abandoned because of the failure to prevent these changes. A notable exception to this problem, however, is bacon, which tolerates a sterilizing dose of radiation without undergoing change.

When we consider irradiation of fresh fruits, we run into another immense problem. Unlike processed foods, fresh fruits are living organisms, and so, they as well as bacteria and fungi can be killed by gamma rays. All living cells are not equally susceptible to these rays, so our only hope is that we can seriously injure or kill disease-causing organisms without seriously injuring the fruits. Fortunately, some of the most serious disease-causing fungi are among the most radiation-sensitive organisms. These are the <u>Penicillium</u> species, which cause blue mold of apples and blue and green molds of citrus; <u>Botrytis cinerea</u>, which causes much of the decay of strawberries; and <u>Monilinia fructicola</u>, which causes Brown Rot of peaches and plums. These fungi can be injured, though not completely killed, by relatively light doses of radiation.

But unfortunately, even such light doses prove to be quite injurious to most fruits. Although the fruits are not killed by such doses, they are changed. Most fruits are softened by the treatment, and sometimes, as with grapes and pears, very greatly softened. Color is sometimes affected: peaches are made redder, while plums are sometimes prevented from turning blue, and pears develop a mottled green-and-yellow instead of a yellow color. But most serious of all, irradiated fruits often fail to develop their normal flavor during subsequent ripening. Since fresh fruits are prized for their characteristic flavors, a loss of these flavors is a prohibitive effect of a treatment.

Another form of injury to fruits is a reduction of their normal resistance to disease-causing fungi. Since light doses of radiation do only injure, not kill the fungi, this is a very serious problem. If irradiated fruits are stored for an extended period after treatment, they very often develop more decay than non-irradiated fruits, for in time, the fungi recover from the treatment while the fruits do not. Also, if the fruits become re-contaminated with fungi, their resistance to these organisms is less than that of unirradiated fruits. This means that radiation could not be used prior to a long storage period; its use would be restricted to a short time before the fruits would be used, such as for a reduction of decay during immediate marketing.

Another problem is expense. An irradiation facility is a very expensive piece of equipment, and one that requires great skill and elaborate precautions for operation. Although it has been found that sprouting of potatoes can be prevented by a very light dose of radiation and without other injury to the tubers, only in certain situations would irradiation of potatoes be economical, at least at the present stage of technology. Such a situation now seems to exist in Canada.

So, it can be seen that there are many problems confronting fruit irradiation. But conspicuously missing from this list of problems is the one that immediately comes to mind in a discussion of irradiation. Irradiation does not make the fruits radioactive. The gamma rays are the product of a radioactive source. They are not themselves radioactive, nor do they make the objects they strike radioactive. <u>Irradiated foods are not radioactive</u>!

Numerous experiments have been made on many different kinds of fruits under many types of conditions. In these experiments, only one fruit has consistently responded well to irradiation, and that is the strawberry. The market life of strawberries is usually extended 2-3 days by irradiation, without injury to the fruit. For a fruit as perishable as strawberries, this extension of market life is quite significant. Research is continuing on this crop, and it is quite possible that in the near future irradiated berries will be arriving on our markets from California. California offers a unique potential for this operation, for its largest production area has a harvest period of at least 3-4 months, with a fairly uniform volume of production during this period. This produces an economic situation that cannot be matched in the East.

It is likely that the encouraging results from irradiation of strawberries and potatoes will continue to stimulate research on ways to treat other fresh fruits and vegetables. However, the great sensitivity of most fresh produce to gamma rays will impose severe restrictions on radiation usage. In addition, the great expense of a radiation facility will impose additional economic restrictions unless future technological break-throughs can greatly reduce its cost. We can expect to continue reading in the popular press, glowing accounts of the use of "magic rays" to preserve foods, for this is fertile ground for journalists, but such reports should be met with a healthy skepticism. Irradiation is certainly no cure-all for post-harvest diseases of fruits.

****

DURATION OF RECEPTIVITY OF HIGHBUSH BLUEBERRY FLOWERS TO POLLINATION

William J. Lord
Department of Plant and Soil Sciences

Studies conducted by J. N. Moore at Beltsville, Maryland, and reported in the Proceedings of the American Society for Horticultural Science, (Vol. 85) indicate that, under field conditions, some fruit set of cultivated highbush blueberries occurred even when pollination was prevented for 8 days after opening of blossoms. The per cent fruit set was significantly reduced, however, when pollination was delayed 6 days or longer on Coville and 8 days on Blueray.

Delaying pollination also resulted in a decrease in average weight per berry. A decrease occurred on Blueray when the pollination delay was only 2 days, whereas a 6-day delay was necessary for a significant reduction to occur on Coville. Nevertheless, an 8-day pollination delay resulted in a more marked reduction in berry weight on Coville than on Blueray.

As Moore pointed out, varietal differences in length of pistil receptivity to pollination may be important when unfavorable conditions for bee activity occur or when the bee population is limited.

****

PUBLICATION AVAILABLE

Technical Information Series Publication No. 2, entitled "A Mechanical Harvesting and Handling System for Processing Apples" is available from the Mailing Room, University of Massachusetts, Amherst. This

publication summarizes the results of an experimental harvesting and handling system tested in a commercial orchard in Massachusetts with the Baldwin variety of apples in 1962.

****

GROWER COMMENTS ON RIPENING OF BLUEBERRIES

William J. Lord
Department of Plant and Soil Sciences

The comments below were written by Mr. O. W. Stewart, Elm Street, R.F.D. 2, Kingston, Massachusetts, in response to an article that appeared in the January, 1965, issue of Fruit Notes entitled "Random Thoughts on Blueberries". I'm sure that readers will find his comments of interest and value. Mr. Stewart is co-chairman of the Research Committee of the Massachusetts Cultivated Blueberry Association.

"These further random thoughts on cultivated blueberries are prompted by your interesting comments in the January 10th issue of Fruit Notes.

"I am restricting these thoughts to the ripening of the fruit, basing them on my past dozen years of experience of growing 1 1/2 acres of blueberries completely enclosed under netting.

"Speaking broadly, I have found that any blueberries, grown under good cultural conditions, will be sweet if permitted to ripen fully on the bush.

"The fact that blueberries have turned blue does not in itself mean that they are ripe. Varieties differ considerably in the time, after becoming fully blue, until the fruit is completely ripe and sweet.

"Berries of some varieties become sweet almost as soon as they turn blue. Among these are Earliblue, Wolcott, G.N. - 87 and Berkeley.

"On the other end of the ripening scale are Blueray, Bluecrop, Herbert and Coville. Such varieties will be deliciously sweet and flavorsome only after they have been on the bush - blue - for a period up to a week and sometimes longer.

"Then there are intermediate varieties which become sweet after a blue period of two to four days. I think the Collins variety may be in this group, with Dixi and others. My variety listings here are far from complete and there will be overlapping in times and in different years. For instance, a prolonged hot spell in early August can cause midseason and late varieties to start ripening together.

"After blueberries are picked, some further ripening can occur, but from my observations, only if they have already ripened near to the point of sweetness. When picked soon after turning blue, fruit of the varieties requiring nearly a week or so of blue color to be sweet, will almost surely remain unripe and sour.

"Birds are responsible for part of the poor reputation of cultivated blueberries with many people. That is, combined with growers who pick unripe berries to get ahead of the birds.

"There are as yet no reliable ways of repelling birds. The only remedy for the bird problem is to exclude them from crops susceptible to bird loss.

"Many blueberries are still grown in the open without covering or enclosure of any type. As a result, growers are faced with the dilemma of either losing much of the crop to birds, or picking blue but unripe berries and placing them on sale or shipping them to market.

"The public should be made aware of the fact that many progressive growers are assuming additional costs in protecting their plantings with netting in order to exclude birds and delay harvest, thus providing riper and sweeter berries."

Editor's Note: In the July 10, 1964, issue of Fruit Notes, Professor J. S. Bailey presented data from Rhode Island that showed the increase in fruit volume after development of blue coloration of highbush blueberries. This increase in volume will result in a sizeable yield increase per acre. In one year, the added income derived by prevention of bird depredation and leaving the berries to "size-up" will go quite a way toward paying the cost of netting.

****

VESPER STRAWBERRY

William J. Lord
Department of Plant and Soil Sciences

The performance of Vesper in grower plantings indicates that it has better quality than Jerseybelle, and is more productive. The fruit ripens late, is very large in size, attractive, moderate in firmness and good in flavor.

Vesper berries appear to soften quickly after they become ripe on the plant. Therefore, it is the opinion of some that Vesper should be harvested daily, or picked every other day while the color is still on the "pink side".

Because of the lateness of bloom, one of our local strawberry nurserymen reports that he is recommending Vesper to growers who have frequent frost damage to strawberries. Also, he reports good acceptance of Vesper by roadside stand operators.

****

POMOLOGICAL PARAGRAPH

Pruning rake: Raking prunings from under fruit trees, in the writer's opinion, is less laborious than gathering and windrowing them by hand. The pruning rake utilizes tongs of hay dump-rakes which are attached to a metal bar. The bar is attached to the 3-point hitch of the tractor and is offset to facilitate raking under trees. The prunings are raked and then dumped in a windrow by stopping the tractor and lifting the rake.

One grower has the third leg of the 3-point hitch longer than the other two, and this is attached underneath the hay rake bar. Thus, when the rake is raised, it automatically dumps the prunings. With a 14 foot offset rake, he can collect and windrow prunings in 25 acres of orchard a day.

****

HANDLING STRAWBERRIES FOR FRESH MARKET

William J. Bramlage
Department of Plant and Soil Sciences

Some timely suggestions on the handling of strawberries are contained in a recent publication, "Handling Strawberries for Fresh Market", California Agricultural Experiment Station Extension Circular 527, by F. G. Mitchell, E. C. Maxie, and A. S. Greathead, of the University of California, Davis.[a] This publication is summarized below.

In discussing handling of strawberries, first of all we must appreciate the nature of the strawberry, one of the most perishable of all fruits. Strawberries are essentially full-ripe at harvest, and being very rapidly respiring living material, they will destroy themselves in a relatively short time, even without the presence of decay organisms. The berries have a very thin, tender skin that is easily broken, and in addition, the flesh is so tender that any time the fruit is squeezed, it becomes bruised and will discolor.

---

[a] This publication may be obtained from the California Agricultural Experiment Station Extension Service, Davis, California

As any grower knows, strawberries are very susceptible to attack by decay organisms. The most common strawberry fruit rot is gray mold, and the fungus that causes this mold is present in every strawberry field at all times. Although the fungus can penetrate the unbroken skin, any injury inflicted during harvesting and handling favors the development of gray mold. In addition to careful handling, practices that will reduce rot are the application of fungicides in the field[b/], careful picking so as to exclude all decayed berries from the packages, and proper cooling of the berries.

Let's consider picking a little more closely. For maximum quality, fruits should be picked when they are full-ripe yet firm, but market requirements may dictate earlier picking. The berries should always be picked with the caps on, and any berry with any sign of rot on it should always be thrown away. The picking operation should be closely supervised, for keep in mind that picker damage can nullify all other attempts to maintain fruit quality.

The most important way to slow down spoilage of strawberries is to remove field heat and maintain the fruit at a low temperature. Field heat will build up rapidly in berries exposed to the sun. Harvested berries should always be placed in the shade, but should also be taken from the field as quickly as possible. A slight breeze will greatly increase the warming of berries even in the shade. An air velocity of just 5 miles an hour (a very mild wind) warms the fruit nearly to air temperature in 20 to 30 minutes. Get the berries under refrigeration soon after harvest.

How important is temperature? When the temperature of strawberries is reduced from 50°F. to 32°, their life expectancy is increased two-to four-fold. If the temperature of the berries reaches 85-90°F., as can happen when picked berries are left in the open field, the market life of the fruit is reduced to only a few hours. For maximum life, strawberries should be kept as close to 32°F. as is practical. And the faster you can get the temperature down, the longer the berries will keep. Forcing cold air over the berries, once they are under refrigeration, will greatly reduce their cooling time.

The problems of handling strawberries during marketing are similar to those during harvesting. The berries must be handled gently for as they get older they are injured even more easily than at harvest. And they must be kept cool. If you expect to hold the berries longer than one day, keep them at a temperature below 40°F., preferably at 32°. And if displayed berries cannot be kept refrigerated, display only a couple hours' supply at a time.

Following are some specific suggestions for getting your strawberries to the consumer with the minimum loss of quality:

1. Pick the berries when they are well-colored, but firm.

[b/] See "Pest Control Chart for Strawberries", available from Mailing Room, University of Massachusetts, Amherst, Massachusetts, or your County Agent

2. Pick them carefully, with caps on, and throw away any berry showing any rot.

3. Handle the berries gently at all times.

4. Keep picked berries shaded, and get them out of the field as quickly as possible.

5. Don't delay cooling. The ideal holding temperature is 32°F., and the closer the berries are to this temperature, the longer they will keep. The effect of temperature is dramatic; it means the difference between a life of several hours and a life of several days.

6. Keep the berries refrigerated at all times, if possible.

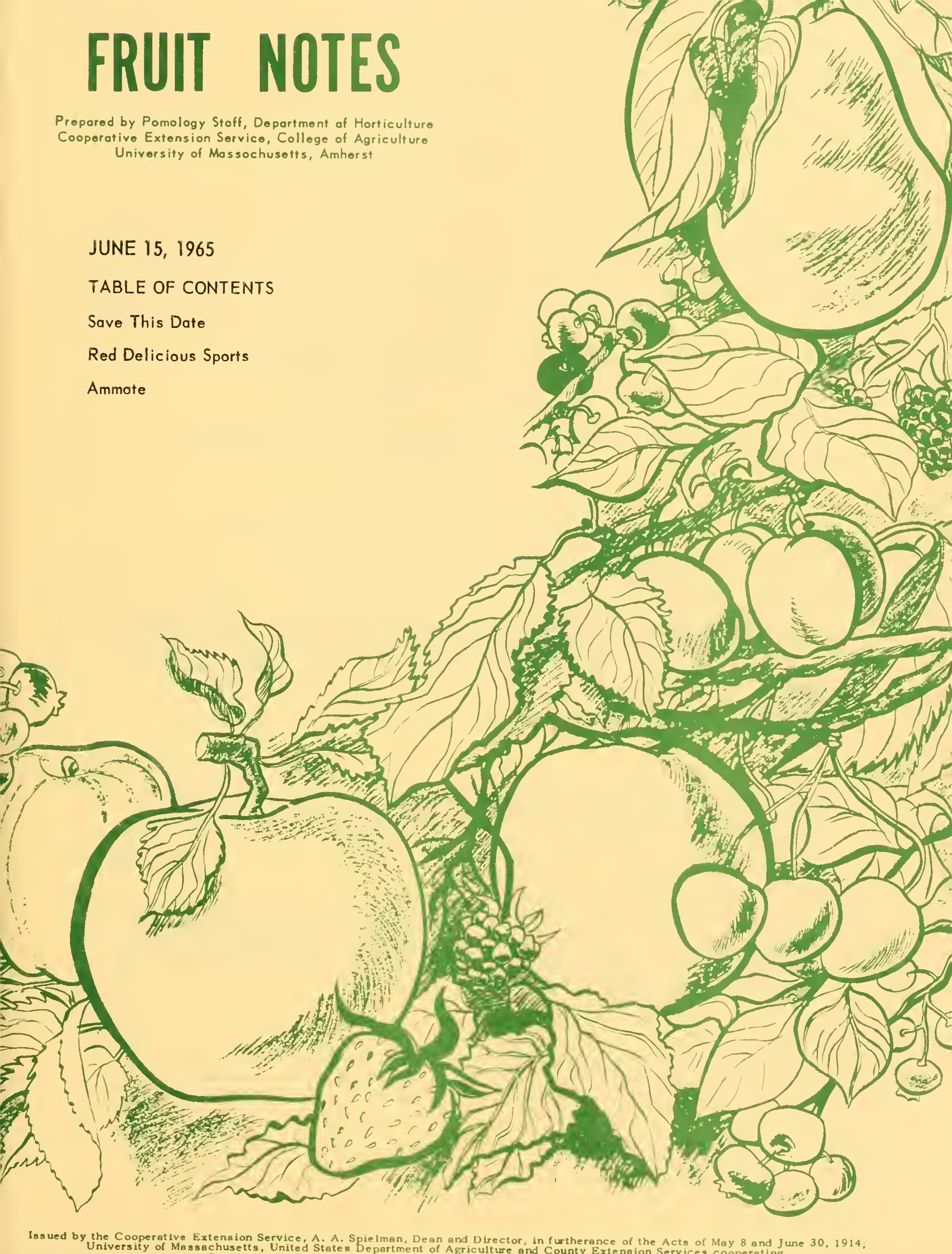
****

FRUIT NOTES

Prepared by Pomology Staff, Department of Horticulture
Cooperative Extension Service, College of Agriculture
University of Massachusetts, Amherst

JUNE 15, 1965

TABLE OF CONTENTS



Issued by the Cooperative Extension Service, A. A. Spielman, Dean and Director, in furtherance of the Acts of May 8 and June 30, 1914; University of Massachusetts, United States Department of Agriculture and County Extension Services cooperating.
Publication Approved by Alfred C. Holland, State Purchasing Agent, No. 44.

S A V E T H I S D A T E

ANNUAL SUMMER MEETING

of the

MASSACHUSETTS FRUIT GROWERS' ASSOCIATION

in cooperation with the

COLLEGE OF AGRICULTURE, UNIVERSITY OF MASSACHUSETTS

will be held at the

FARM OF CHARLES A. DOWSE, JR., MAIN STREET

SHERBORN,* WEDNESDAY, JULY 14, 1965

The program is not available at this time. As customary, the meeting will start at 10:00 A.M., with a tour of the farm, roadside stand and packing facilities. Lunch will be served at noon and the speaking part of the program will start at 1:30 P.M.

*Directions: For those coming from western Massachusetts, leave the Mass. Pike at Exit 13 in Framingham. Then proceed East on Route 30 about 1 mile to Route 27. Go south on Route 27 (across Route 9) through Natick. The farm is located about 2 miles beyond Natick on Route 27.

For those coming from Essex County and southeastern New Hampshire, take Route 128 and then Route 16 through Wellesley and South Natick to Route 27. Turn right on Route 27 and proceed for approximately 1/2 mile.

RED DELICIOUS SPORTS

William J. Lord
Department of Plant and Soil Sciences

The Extension Pomologist had the privilege of participating in a panel discussion on Red Delicious sports at the Annual Meeting of the State Horticulture Association of Pennsylvania in February, 1965. The following are the comments of the other participants on the performance of Red Delicious sports in Pennsylvania and West Virginia as taken from the February, 1965, issue of Pennsylvania Fruit News.

C. M. Ritter
Department of Horticulture
The Penna. State University

"For the past five years studies of some 25-30 Delicious color sports of the Delicious apple variety have been under study at University Park.

"The vast array of these sports - over 60 named so far - are very confusing to most growers. The question of which one(s) to plant is almost impossible to answer because of the varying responses of the several sports to diverse soil and environmental conditions. For this reason we have assembled at University Park a continually increasing number of these sports, both standard and spur types, in order that their fruit characteristics may be observed under a single set of cultural and environmental conditions.

"The following is a thumbnail sketch of the appearance and skin color of 15 Delcious sports as grown in the College Orchards at University Park.

"In the following summaries the 'standard' for color comparison is regular Delicious except where otherwise noted.

"BRIDGHAM RED:

A color sport of regular Delicious with a light red color of about the same intensity of the parent type. It usually is solid red over more than 80% of the fruit although this varies widely. The type is poor and the sport is little or no better than the parent type.

"GARDNER:

The fruit color is good to excellent. It is solid red washed and of a brighter red intensity than the parent. However, it lacks typiness and carries a definitely greenish ground color.

"KIRBY:

The size and color are fair to very good, however, the color tends to fade or become dull as the fruit nears harvest. It has very prominent lenticels which may detract from its appearance. Better than the standard type.

"SHOTWELL:

The fruit run slightly smaller than the parent type. The fruit has a very good bright red wash over the whole apple, but it lacks the typiness of the western-grown Delicious.

"VANCE:

The color is excellent - one of the four or five best in this respect at University Park. The size is usually slightly smaller than the parent type. The crowns are very prominent, but in cross section the fruit is round, rather than ribbed.

"RICHARED:

Excellent bright cherry-red color, has desirable Delicious type. This is one of the best of the sports now fruiting at Penn State.

"ROYAL RED:

A sport of Richared, the fruit possess excellent color and Delicious type. The solid red color may become too dark for some, but this does not appear as a deterrant to its planting in the state. An excellent strain both in tree and fruit characteristics.

"STARKING:

Possesses both solid red wash and rather pronounced darker red stripes. Some growers find the stripes objectionable, but opinion is divided. Shape and type are only fair to good.

"EARLIRED:

Of the sports now fruiting at University Park, this is the only one which exhibits any marked degree of difference with the average Delicious. It averages approximately 3/4" larger size than any of the strains now fruiting. Whether or not this is a juvenile characteristic remains to be seen. Shape is poor and the fruit tend to internal breakdown more than the other sports. The color is very good and this sport may hold promise where a specialty market demands large size.

"HI EARLY RED:

This is one of the 4-5 "best sports as grown at University Park - at least equal in color, and color pattern, and shape to Royal Red. Many specimens do, however, exhibit rather pronounced stripes.

"HI RED:

As grown at University Park the color is a rather "muddy" red, variable and is little, if any, better than the standard Delicious.

"IMPERIAL:

An excellent sport, at least equal to Royal Red and Hi Early Red in color and intensity and shape. It does not have pronounced stripes.

"RED KING:

A fairly typey sport, with excellent dark red color, it does show pronounced dark red stripes.

"RED QUEEN:

Excellent color, with some striping, it is a rather good Delicious type.

"TURNER:

Color and type are quite variable. The ground color remains green. This sport shows little promise for Pennsylvania orchards.

"Of the 15 sports listed above, the VANCE, RICHARED, ROYAL RED, HI EARLY RED, and IMPERIAL appear to have the most promise at this time. As the other sports, now growing at University Park, come into bearing this statement may well have to be changed."

William B. Lower
Boyers Nurseries and Orchards
Biglerville, Pennsylvania

"We prefer Royal Red, on standard rootstock, among all of the Delicious strains, excluding the spur types. However, the economy of the smaller tree on standard rootstock has influenced us to plant more of the spur-type Delicious. Our experience with the Redspur Delicious is rather limited as we have fruited them for only five years. However, we now believe that they definitely have a place in our planting plans.

"In evaluating the spur-types, we must weigh them against the performance of the standard tree-size strains. Some growers say that they cannot live with the slow growth habit of the spur-types, nor can they build a good tree because of the upright limb angles. Another problem is the possibility of damage to the fruit from limb - or spur - rubs during some years. Possibly, this will affect the Golden Delicious spur-type trees more than the Red Delicious types.

"Because the spur type is less vigorous than the regular Delicious sports it should be planted on the heavier (clay loams) soil types and serious consideration should be given to irrigating them. These trees

need to be planted close, but there is a danger from crowding with too many trees. Further mildew may be a problem during wet years where poor air drainage exists in the thickly planted orchard. In orchards where the spur-types are planted 100 to 200 trees per acre and the standard sized trees are set 50-75 trees per acre, the grower may need two sets of equipment to do a good spray job. Despite all of these negative aspects we believe that the use of the spur-type trees is economically sound.

"This past season the limb-rub damage on apples from our spur-type trees was very small. In grading we felt that they were commercially quite profitable. The yield and size were good, and there was less loss due to lack of red color than in any of the other Delicious strains that we have in our orchards. The fruit from our Royal Red and Shotwell trees were larger and brighter in color than those from the spur-type trees, but the loss due to poor coloring inside the tree was greater.

"The most widely planted and the oldest Delicious spurs that we have is the Bisbee strain of Starking. We have some 20 strains of Red Delicious fruiting and of these the Bisbee produces the typiest apple - longer and narrower than any other. The authorities will tell you that the lightness of the soil, height of elevation, and continous moisture produces the longer fruit - I don't question this but I do know that we get the best type fruit from the spur Delicious. The solid color of this spur-type fruit is more of a dark purple than a cherry-red, the skin is thicker and the fruit matures later than Starking. The spur-type apples store well - coming out late in the season with good eating quality.

"Topred, a sport of Shotwell, looks good to us. Its color is brighter than the Starking sports, although the tree characteristics are similar.

"The Wellspur and Redspur sports of Starking have a slow growth habit and the problem of upright limbs. In our experience they both have a lower red color factor than either the Bisbee or Millerspur strains.

"Miller Sturdyspur is so new with us that we hesitate to make an evaluation. Our small trees have wider crotches and are less vigorous than the standard sports. The fruit color is a good cherry-red without dullness. We are told that the fruit matures earlier than Bisbee and is of good size. The only trees of this strain that I have observed are in their third growing season.

"In summary; with the spur-type Delicious, we obtain a reduction in tree size, early bearing is induced, good anchorage is obtained with the standard rootstock and the stiff upright growth of the main limbs practically eliminates propping. The quality and color of the fruit is acceptable, if not quite all that might be desired."

Edwin Gould
West Virginia Agricultural Experiment Station
Kearneysville, W. Viginia

"Current trends in the apple industry emphasize the importance of varieties. They are one of the basic essentials for success. The decision as to which varieties to plant is a very difficult one to make. It is not so difficult, however, to know which varieties are most profitable at any given time. The problem of special concern is in predicting future demands. There has been a significant trend towards fewer and fewer varieties in most commercial orchards throughout this country. This has resulted primarily from the pressure of distributor demand. In West Virginia most new developments now consider only about three main varieties; Red and Golden Delicious and Yorks. Of these three varieties only the Red Delicious is consistently dependable for the fresh market.

"The Red Delicious is rapidly becoming the most popular variety of apples grown in West Virginia. There has been a significant increase in plantings of Delicious in all new developments considered for the fresh market. There are a number of factors responsible for this significant trend. It is by far the most popular variety grown in this country today. It is a premium variety in most markets. The recent discovery of many very promising new budsport strains of Delicious has been another important factor. There is much concern that it may already be overplanted. This may well be true but the continued heavy plantings in all areas where it can be grown emphasizes the general belief that there will never be an overproduction of good, well-colored Red Delicious until there is an overproduction of apples for the fresh market. An overproduction of Red Delicious, however, would tend to adjust itself rather quickly because there is little demand for it by the processing industry.

"The recent discovery and the development of a large series of very impressive new budsport strains of Red Delicious indicates an even more promising future for this already popular variety. The first important series of budsport mutations of Red Delicious was discovered more than a half-century ago. Several of these became established and have been an important factor in developing the Delicious variety to its present popularity. The first of a new series of budsport strains was discovered about twelve years ago. Since then a large number of very promising strains have been discovered and brought under commercial development. In the first series of mutations the main factor of concern was the time and intensity of fruit color formation. In the latest series, however, there are two dominant factors of consideration. In addition to the fruit color formation there is a very interesting and highly important semi-dwarf spur-type tree growth characteristic factor in many of the new mutations. The combination of the two factors emphasizes the importance of these new strains.

"We now have more than seventy of these new budsport strains of Red Delicious under evaluation. Some of these have been under development for several years while still others are just being introduced. Approximately one-third of the new selections are semi-dwarf spur-type

strains. There are many reasons for the intensive effort to evaluate the relative merits of these various new strains. Perhaps the most significant factor is the increasing demand for more intensive fruit color. For many years most of the fruit in this country was packed under a U. S. No. 1 grade with a maximum color requirement of twenty-five per cent for most varieties. The demand today is for one hundred per cent color. Thus full color has become an important factor in market demand. The second factor has been the recent trend towards dense plantings in combination with tree size control. Thus, the reason for the special interest in the new strains with both fruit color and dwarfing characteristics. It is very significant that we should be favored with so many promising new strains in our most popular variety. It is also interesting that the mutations affect the two most important factors: fruit color formation and tree growth characteristics.

"Extensive information is now available on many of the new budsport strains of Red Delicious. It will be many years, however, before adequate evaluations are available for general commercial use. In the meantime these new strains are being planted exclusively in all areas where adequate good fruit color is a factor. Progressive management will recognize the importance of obtaining the latest available information before making additional new plantings. It is expected that current ratings will change with additional information and as new selections are evaluated and introduced.

"Current evaluations indicate that some of the more promising new standard strains of Red Delicious include such selections as Topred, Houser, Chelan Red, Red Prince and Ryan Red. From the standpoint of earliness, intensity and quality of fruit color formation, these selections have been very impressive. In some areas the Harrold strain has been very good. Under conditions where adequate good color is not too difficult to obtain selections such as Royal Red and Imperial have proven to be very satisfactory. It should be emphasized, however, that from the standpoint of earliness and intensity of fruit color formation, practically all of the new mutations are far superior to existing strains such as Starking and Richared. There is concern that some of these new strains may carry too intense a color factor and become too dark by time of picking maturity. This may well be true in some areas. In many of these new strains there undoubtedly will be some sacrifice in quality for quantity of color. Current trends, however, would indicate preferance for a dark, fully colored apple over a green one. Seldom does too much color result in reduced profits.

"The semi-dwarf spur-type strains are of special interest in new developments. Most of the strains now under commercial development have been evaluated quite extensively. Available information indicates very little difference between the various selections. Those which have been well evaluated include Starkrimson, Sturdyspur, Redspur and Wellspur. There may be a slight preference for these strains in the order listed but under field conditions it is quite difficult to differentiate between them. In general, the spur-types have not been quite as impressive under Eastern conditions as have some of the standard strains. Under adverse conditions they tend to color late with a dull

muddy under-color and may finish off somewhat darker. Under similar conditions they tend to develop green flesh which may well persist to time of overmaturity. As a result of excessive fruit spur development, they tend to overset and become biennial. The upright growth characteristic also favors excessive limb or spur rub during the first few crop years. These comments are intended to emphasize some of the less favorable characteristics of the spur-type strains. They are not intended to discourage planting them. They should certainly have a prominent place in any sizeable planting of Red Delicious. The ideal would be a strain with fruit characteristics of strains such as Topred or Houser combined with the tree growth characteristics of the spur-type.

"Special consideration is being given to the relative maturity and keeping qualities of the various new budsport strains of Red Delicious. Information on this factor, however, leaves much to be desired. Most of our experimental developments are just now reaching the stage where significant specific data can be obtained. Limited data together with extensive observations indicate rater definite trends. These indications, however, may well change with more significant data. Information now available indicates that there is not very much difference in time of relative maturity between the different strains. At this time there would not seem to be more than four or five days difference in time of maturity between strains. This degree of difference is no greater than that observed for the same strain grown under different conditions and on different age trees. In general, all of the spur-type strains appear to be about the same in time of maturity. They all appear to be late in maturing. There are indications that there is a correlation between fruit color pattern and time of maturity. Strains with a solid color pattern such as Houser, Chelan Red and Royal Red appear to mature somewhat later than the striped color pattern strains such as Topred, Red Prince, Red Queen and Red King. This would indicate the desirability of selecting several strains for any sizeable planting of Red Delicious."

(Editor's Notes: Although our experience with Red Delicious sports is limited, most are too dark in color when grown in New England orchards. We prefer the cherry-red color of Richared.

At the meeting in Pennsylvania, Dr. C. M. Ritter displayed Red Delicious sports grown on the Pennsylvania State University Horticultural farm and discussed in his article quoted above. To the eyes of a New Englander, the majority of sports displayed were either too dark or dark with objectionable stripes. The color of Richared was outstanding.

Professor Edwin Gould mentioned that special consideration is being given to dates of maturity and keeping qualities of the Red Delicious sports. Selection of several strains to spread the harvest season of Red Delicious would be advantageous. This is particularly important since we know that watercore is associated with over-maturity. Based on the incidence of watercore, data obtained at Amherst indicates that Richared matures earlier than Starking.)

****

AMMATE

William J. Lord
Department of Plant and Soil Sciences

Ammate is now labelled for use in apple and pear orchards for the control of poison ivy. It can be applied any time during the growing season but is most effective if applied during late June or July.

It is used at the rate of 60 lbs. per 100 gallons of water. The addition of a good spreader-sticker will increase considerably its effectiveness.

If the first application does not result in a complete kill, retreating may be done later in the season or the next year. Ammate is effective, non-toxic to humans or animals, noninflamable and very readily soluable in water. On the other hand, it is non-selective and will kill almost all plants if applied in sufficient quantity. It is very corrosive on metals and should never be left in the "weed" sprayer longer than necessary. After its use, the sprayer, should be very thoroughly washed both inside and out. Some spray lime, baking soda or soap powder added to the wash water will help to do a thorough job.

****

All pesticide chemicals mentioned in this publication are registered and cleared for the suggested uses in accordance with federal laws and regulations. Chapter 727, Acts of 1960, Commonwealth of Massachusetts requires that all pesticides sold in Massachusetts be registered with the Massachusetts Department of Public Health. Trade names, where used for clearness, do not indicate endorsement nor imply that similar products are not satisfactory.

WARNING! MOST PESTICIDES ARE POISONOUS. READ AND FOLLOW ALL DIRECTIONS AND SAFETY PRECAUTIONS ON LABELS. HANDLE CAREFULLY AND STORE OUT OF REACH OF CHILDREN, PETS AND LIVESTOCK.

FRUIT NOTES

Prepared by Pomology Staff, Department of Horticulture
Cooperative Extension Service, College of Agriculture
University of Massachusetts, Amherst

JULY — AUGUST 1965

TABLE OF CONTENTS

Issued by the Cooperative Extension Service, A. A. Spielman, Dean and Director, in furtherance of the Acts of May 8 and June 30, 1914; University of Massachusetts, United States Department of Agriculture and County Extension Services cooperating.
Publication Approved by Alfred C. Holland, State Purchasing Agent, No. 44.

STORAGE AND RIPENING OF PEARS

William J. Bramlage
Department of Plant and Soil Sciences

A high-quality pear is truly a delicacy, but it's a delicacy much too seldom offered to the public. Storage or ripening at an improper temperature very often results in the failure of pears to develop their full potential quality. Recent work by Dr. S. W. Porritt of Summerland, B. C., Research Station of the Canada Department of Agriculture has clearly illustrated the sensitivity of pears to temperature conditions.

Unlike apples, most pear varieties do not ripen normally in cold storage. Porritt found that Bartlett pears ripened normally at 60° and 70° F, but not at lower temperatures. At 50°, they developed a dry texture and poor quality. At 30°, the fruit failed to soften, and furthermore, after extended storage time they even lost their capacity to ripen when brought to 60-70°; this loss of ripening capacity was preceded by a yellowing of the fruits at 30°, although they did not soften.

Anjou pears differ from most other varieties. For one thing, they will ripen normally at low temperatures. In Porritt's study, Anjous ripened normally at temperatures of 32° to 50°, though of course, the lower the temperature, the more slowly they ripened. Anjous were also different in that when held at 50° or higher, they failed to ripen properly unless they were first stored at 30-40°. Thus, they required a period of cold storage prior to ripening. This requirement seems to be intensified if the fruits are picked prematurely.

Not unlike apples, storage temperature has a marked effect on the storage life of pears. Porritt's results showed that for Bartletts, storage life at 30° was extended 40% and 70% over that at 32° and 34°, respectively; for Anjous, storage life at 30° was extended 35% and 125% over that at 32° and 34°, respectively. A long storage life demands good temperature control in the storage.

Another factor that sharply influenced quality of pears was the speed with which the fruits were brought to 30° after harvest. Porritt held Bartlett pears at 65° for 1, 2, 3, or 4 days before cooling them to 30°, and also used periods of 4, 6, 8, 10, or 14 days to cool the pears from 65° to 30°. In every case, the longer the delay in cooling to 30°, the more rapidly the pears deteriorated. The delay in cooling had an especially striking effect on the occurrence of core breakdown; for example, pears held at 65° for 0, 1, 2, or 4 days before storage at 30° developed 0, 26, 52, and 71% core breakdown, respectively, after 12 weeks in storage plus 10 days at 70°.

From these results, which agree closely with results from other studies, several guidelines can be laid down for handling of pears:

1. After harvesting, cool the fruits as rapidly as possible;

2. Store the pears at 30°;

3. For maximum quality, ripen the pears at 60-70°. A convenient index of how well pears are holding-up in storage is their color. When the fruits begin to lose their green color, they must be marketed quickly, for their storage life has ended.

****

TREE NUMBERS IN WASHINGTON, AND PROJECTED PRODUCTION

William J. Lord
Department of Plant and Soil Sciences

The 1961 Washington Fruit Tree Census recently published, shows that in central Washington, the number of fruit trees increased by 25% from 1949 to 1961. Apple trees increased by 64%, Bartlett pears by 51%, winter pears by 27%, and cherries by 17%. Prune tree number increased by only 1%, and peaches, apricots and plums decreased.

Comparison of the 1961 census in central Washington with the 1949 census of the whole state shows that there were 7 times as many Golden Delicious trees in 1961 as in 1949 and nearly 3 times as many Red Delicious trees. The number of Rome Beauty trees remained about the same, while varieties such as Winesap, standard Delicious and Jonathan decreased in tree number.

Based on apple tree numbers for the entire state, an estimated projected production for 1965 of 34,000,000 bushels of apples was obtained. This compares with an average production from 1957-1961 of 23,000,000 bushels.

Additional production increases are anticipated during the 5 year period of 1965-1970.

****

ROADSIDE MARKETING

William J. Lord
Department of Plant and Soil Sciences

While recently visiting roadside stands in several Northeastern states, some interesting innovations were noted.

Plastic bags are frequently being used to line the wooden display baskets. This enables the grower to maintain the farm stand atmosphere with the wooden basket, while utilizing the plastic bag as the take-home container. The customer makes her selection and carries the basket (1-16

quarts) to the check-out counter. The clerk seals the bag with a wire "twistum" and hands it to the customer.

Baskets are expensive and they tear seat covers and clothes of the customer. Plastic bags are neither expensive not abrasive, and they are easier for the customer to dispose of than baskets. The apples in the plastic bag will not spill on the floor or seat of the car, as frequently happens with some baskets and paper-handle bags.

The stands visited varied as to the use of the plastic bags. Frequently, however, the plastic bags were used as the take home package for only the lower quality fruit.

At one stand, in addition to the price for the container of fruit, the approximate cost per pound was indicated. This was done to make the customers realize the economy as well as the extra quality derived by purchasing fruit at roadside stands.

Selling other items besides fruit without destroying the farm stand atmosphere is a problem of concern with stand operators. Two roadside stand operations were making and selling pies. Another stand was selling frozen pies. The pies appeared to be a profitable item and an excellent way to utilize lower grades of fruit and the talents of a few housewives in the community. Other stands were selling high quality specialty items of processed food products that made attractive displays and increased gross sales.

****

NEW HAMPSHIRE FRUIT TREE SURVEY

William J. Lord
Department of Plant and Soil Sciences

The New Hampshire Fruit Tree Survey, based on production in 1963, shows that Hillsboro and Rockingham are the leading apple-producing counties in the state. Hillsboro County produces approximately 50% and Rockingham County slightly more than 25% of the state's entire apple crop.

The 25 largest orchards produced 1,118,624 bushels of apples in 1963, or 72% of the state crop. Two orchards produced 100,000 to 125,000 bushels each.

Based on number of trees on standard root stock, McIntosh, Delicious (regular and red strains), Baldwin and Cortland were the 4 leading varieties in New Hampshire. It was of interest to note, however, that only 174 of the 14,898 Baldwin trees were 13 years of age or less.

Of the apple trees on standard root stock, there were 3.6 times as many McIntosh as Delicious (regular and red strains). Of the trees 7

years of age or less, however, McIntosh outnumbered Delicious (regular and red strains) by only a 2-to-1 margin.

Golden Delicious will become more important in the future since over 60% of the trees on standard root stock of this variety are 7 years of age or less.

Spur-type trees and trees on size-controlling rootstocks made up about 8% of all apple trees recorded in the 1963 survey, but of the trees 7 years of age or less, nearly half were of these types.

The number of spur-type Red Delicious trees and trees of this variety on Malling II and VII rootstock were approximately equal. Spur-type Red Delicious and those of this variety on size-controlling rootstocks outnumbered McIntosh on size-controlling rootstocks 8172 to 4880.

****

POMOLOGICAL PARAGRAPH

Dominic A. Marini
Regional Agricultural Specialist
Southeast Extension Region

Winter injury may be more of a problem in strawberry growing than is generally realized. Vermont horticultural researchers have found that strawberries can be injured by a temperature of 28°F, resulting in smaller plants and reduced yields. Plants are killed at temperatures between 15° and 20°F.

The kind of weather conditions to which plants are exposed influences the severity of injury. It was found that injury increased as the rapidity of freezing increased. By the same token, injury increased as the rate of thawing increased. And the longer the period of exposure to low temperature, the more severe the injury.

Snow was found to be the best cover for protecting plants from winter injury. A snow fence consisting of a row of sunflowers grown 6 inches apart increased the snow cover to the extent that the strawberry bed was still snow-covered after a January thaw while the surrounding ground was bare. The seed heads were cut off the sunflowers to prevent breakage. A spacing of 8 rows of strawberries between rows of sunflowers is recommended.

****

FURTHER OBSERVATIONS ON DRY LIME SCRUBBING

W. J. Lord, Bertram Gersten and J. W. Zahradnik[1]

A large percentage of our CA volume during this past storage season was in rooms that were partly or completely lime scrubbed. With one exception, no difficulty was encountered with dry lime scrubbers in maintaining the CO_2 level below 5%, once this level had been attained. The difficulty at this storage was corrected by changing the lime. Prior to changing the lime at 6:30 P.M. on November 14, the CO_2 level was 5.7% and rising. By 9:00 A.M. the next morning, after changing the lime, the CO_2 had dropped to 3.5%. This indicates the feasibility of changing lime during the storage season.

Field Observations

During October, 1964, 30 lime samples were obtained from several grower-owned storages for analysis of carbon dioxide content prior to use in lime boxes. The CO_2 content ranged from 0.71 - 1.6%. At the end of the storage season, the CO_2 content varied considerably from bag to bag in the same lime box. For example, 3 bags of lime, each having 0.88% CO_2 equivalent content prior to storage, analyzed 21, 29, and 31% CO_2 equivalent respectively, at the end of storage. At another storage, 3 bags of lime with initial similar analysis had 15, 26 and 27% CO_2 equivalent content after the storage season. Whether or not this variability is caused by variable air movement around the bags is not known.

The effectiveness of lime placed in rooms to supplement the caustic soda, water or dry lime scrubbers was variable, also. For example, one room with 1/2 pound of lime per bushel of apples was caustic soda scrubbed the 11th day after closing. At another storage, 1/2 pound of lime per bushel of apples held the CO_2 below 5.0% for 90 days.

Placement of lime in rooms can result in a considerable saving in caustic soda. As an illustration, one storage operator generally used 1000 pounds of caustic soda during the first 7 days after closing a room of 17,500 bushel capacity. In 1964, 2000 pounds of lime was placed in the room (0.1 pounds per bushel), and only 50 pounds of caustic soda was necessary during the first 7 days after closing. After the first 7 days in 1964, the CO_2 level was maintained with periodic charges of 50 pounds of caustic soda instead of 100 pounds every day.

---

[1]Assoc. Prof., Department of Plant and Soil Sciences
Asst. Prof., Feed and Fertilizer Control Service and
Assoc. Prof., Department of Agricultural Engineering, respectively.

Changes That Lime Undergoes in the Scrubber

There are 3 types of lime in commercial use: carbonates, hydroxides and burnt or caustic lime. The carbonate forms are of no value for scrubbing, since they are naturally saturated with CO_2. Because of its caustic properties, burnt lime presents a potential danger to the user and may prove hazardous when subjected to scrubbing conditions. Hydrated lime, the hydroxide form, is the only lime that should be used for scrubbing.

Although the expression of guarantee on the bag is in terms of CaO and MgO, the Ca and Mg are actually in the hydrate form, $Ca(OH)_2$ and $Mg(OH)_2$.

The reaction that takes place in the scrubber is as follows:

$$Ca(OH)_2 + CO_2 \text{---} CaCO_3 + H_2O$$
$$Mg(OH)_2 + CO_2 \text{---} MgCO_3 + H_2O$$

With the dolomitic limes, less CO_2 absorption takes place than with the high-calcium hydrated limes. This is due to the lower reactivity of the $Mg(OH)_2$ in dolomites. Consequently, greater amounts of dolomitic lime are needed, depending on the $Mg(OH)_2$ content, than if high-calcium hydrated limes are used.

Preliminary Tests

At the University storage, we tested one bag each of 3 different types of lime in a small dry-lime scrubber. We realize that these results cannot be regarded as representing the 3 limes, because of the small size of the sample, but the data in Tables 1 and 2 are of interest from the standpoint of rate and final apparent equilibrium level of CO_2 absorbed.

The high-calcium lime (lime A) absorbed CO_2 to a greater degree than did limes B and C (Table 1). The CO_2 absorption of limes B and C did not differ appreciably.

Table 1: Comparative carbon dioxide absorption of three types of lime, 1964-65

Sampling date	% CO_2 content in lime: A*	B**	C***
10/19	2.1	6.2	1.6
11/23	22.9	16.9	10.5
12/21	18.8	22.0	11.4
1/18	23.2	20.4	21.6
2/19	38.2	25.8	22.4
3/19	39.6	27.2	24.6
% CO_2 uptake	37.5	21.4	23.0

*A High-calcium hydrated lime - (CaO, 72-74%; MgO, 0.2-0.6%).
**B Hydrated dolomitic lime - (CaO, 43-45%; MgO, 26-28%)
***C Dolomitic spray lime - (CaO, 45%; min. MgO, 30%)

The initial rate of CO_2 absorption was the greatest with the high calcium lime. It is the initail rate of CO_2 absorption which determines the scrubber size for a given sized storage and a given number of lime loadings.

Beginning in November, we obtained a lime sample at the top of the bag and a representative sample of the entire bag content. The CO_2 equivalent content at the top of the bag was higher during the early stages of storage than the CO_2 equivalent of the representative sample (Table 2). By the end of storage, however, the CO_2 equivalent content at the top of the bag and throughout the bag were similar.

Table 2: Carbon dioxide equivalent of lime in top of bags in comparison to entire bag content.[1]

Date	% CO_2 content in lime: A		B		C	
	Entire bag	Top of bag	Entire bag	Top of bag	Entire bag	Top of bag
11/23	22.9	38.9	16.9	28.8	10.5	27.1
12/21	18.8	38.7	22.0	28.9	11.4	27.6
1/18	23.2	36.7	20.4	28.5	21.6	26.5
2/19	38.2	36.1	25.8	27.4	22.4	25.8
3/19	39.6	37.8	27.2	27.8	24.6	26.4

[1]Bags of lime placed vertically in scrubber.

Summary

On the basis of the above field observations and the preliminary tests at the University, it appears that the following practices are justified.

1. Purchase of high calcium hydrated lime bagged in paper highly permeable to CO_2 to achieve the initial high rate of CO_2 absorption and thereby minimize scrubber size.

2. Purchase of lime according to the tentative specifications of not more than 8% carbonates as CO_2.

3. Addition of not more than 1/3 pound of lime per bushel of apples in the storage when used as a supplement to other types of scrubber in order to minimize the possibility of excessively low CO_2 level.

Reseach indicates that atmospheres of less than 2 per cent carbon dioxide for McIntosh may be deleterious to the fruit. The time period

that carbon dioxide was below 2 per cent varied from 1 to 20 days after closing in the storages using lime as a supplement to scrubbing. Whether or not a 20 day period below 2 per cent carbon dioxide would be deleterious to the fruit is not known. Growers that use lime as a supplement to scrubbers might devise some way to restrict air movement around the lime bags. The suspension of a plastic sheet over the lime which can be raised or lowered is a possibility.

****

PUBLICATIONS AVAILABLE

Available upon request through your County Extension Service or by writing to the mailing room, University of Massachusetts, are the following publications:

Special Circular No. 254*- Preharvest Drop Control of Apples

Special Circular No. 246 - Be A Better Apple Picker

Special Circular No. 246A- Be A Better Apple Picker (Spanish Translation)

Special Circular No. 277*- Scald Control for Apples

Leaflet - Ladder Safety in the Orchard

*These were printed in 1963. Since there are no changes in recommendations, the information is still valid.

****

POMOLOGICAL PARAGRAPHS

Growing Young Apple Trees: A 100 inch minimum total terminal growth should be the growth standard for apple trees the year of planting. If your trees make 150-170 inches of growth, consider it a job well done.

. . . . . .

A Time Saver: A Massachusetts fruit grower finds having two sets of picking ladders worthwhile in spite of the additionsl expense. This makes it possible to have ladders waiting for the pickers instead of the pickers waiting for ladders. The time loss waiting for ladders when moving from orchard to orchard is eliminated.

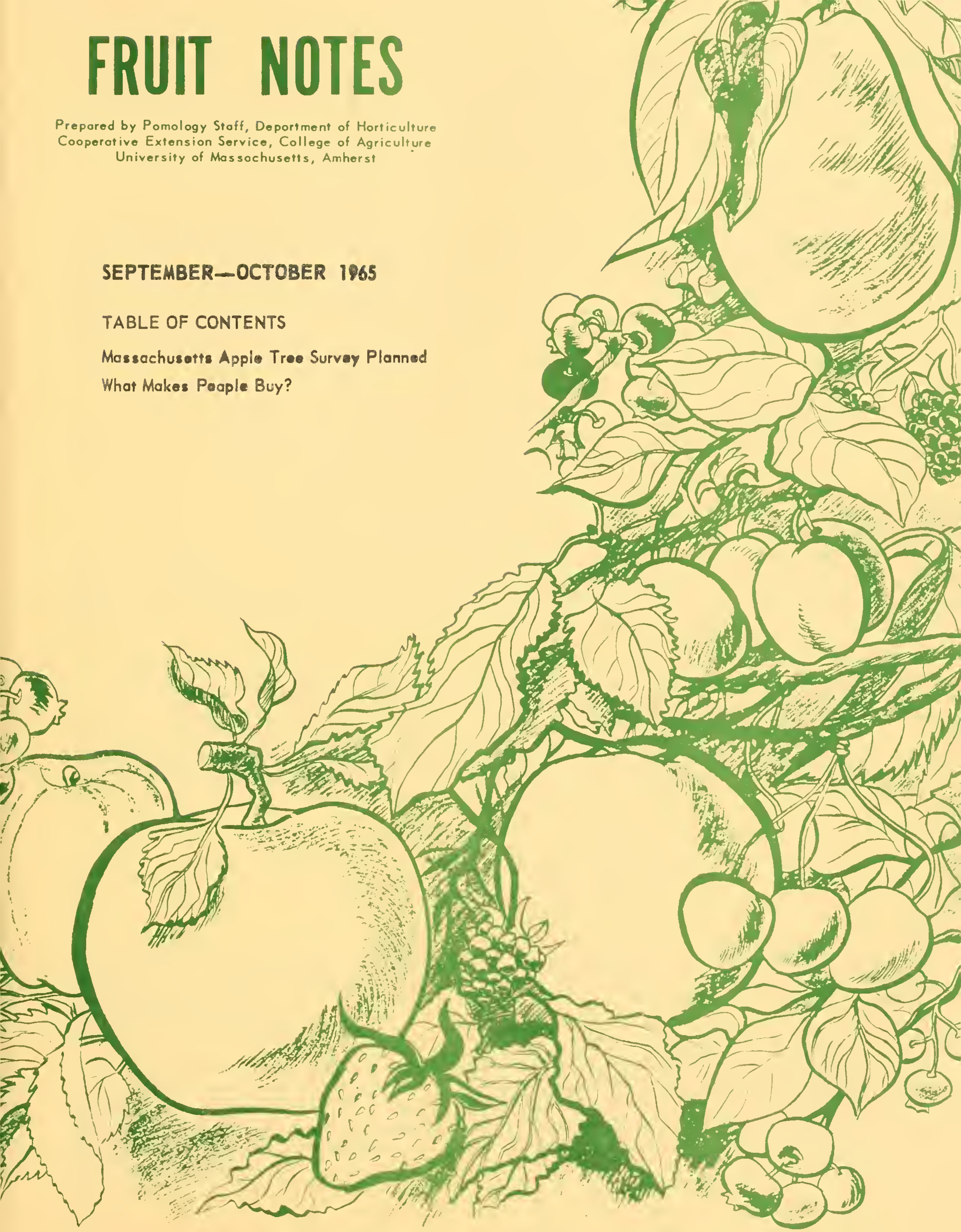
****

FRUIT NOTES

Prepared by Pomology Staff, Department of Horticulture
Cooperative Extension Service, College of Agriculture
University of Massachusetts, Amherst

SEPTEMBER—OCTOBER 1965

TABLE OF CONTENTS



Issued by the Cooperative Extension Service, A. A. Spielman, Dean and Director, in furtherance of the Acts of May 8 and June 30, 1914; University of Massachusetts, United States Department of Agriculture and County Extension Services cooperating.
Publication Approved by Alfred C. Holland, State Purchasing Agent, No. 44.

MASSACHUSETTS APPLE TREE SURVEY PLANNED

Byron S. Peterson
United States Department of Agriculture
Statistical Reporting Service

In 1955 the Departments of Horticulture and Agricultural Economics at the University of Massachusetts cooperated in a Massachusetts apple tree survey. This survey provided information on the number of farms with 100 or more trees and the age and variety distribution for the State and by counties. Similar surveys had been made in 1925 and 1940. Plans are now being made for a similar survey to be made following harvest of the 1965 crop. Publication is planned for the spring of 1966.

The 1965 survey has been planned in cooperation with each of the New England States so that it will be possible to show details for each State and for the region. New York State also is actively planning for a 1965 fruit tree survey so it is expected that for selected data it will be possible to show New York-New England totals.

Financial support for the 1965 survey will be provided by the Massachusetts State Department of Agriculture and matched Federal funds under provisions of the Agricultural Marketing Act of 1946. The Department of Plant and Soil Sciences and the Extension Service are active cooperators in the survey while overall coordination will be the responsibility of the New England Crop Reporting Service.

As with all surveys of this kind, the most important element is the assistance of growers who provide information for the orchards they operate. The survey form will be mailed to each orchardist who will be asked to complete and return the form. The summary of these reports will provide timely information that will be useful in making plans for planting, producing and marketing Massachusetts and New England apples.

****

WHAT MAKES PEOPLE BUY?

Henry V. Courtenay
(Reprinted from "Hoosier Horticulture" by permission of Prof. Henry V. Courtenay, Extension Specialist, Consumer Economics, Purdue University, Lafayette, Indiana.)

This is the age of the consumer and the age of consumer research. Since more than 90% of all consumer food purchasing is done by women, let's take a look at this female consumer. Let me start by making the profound statement that 'women are different from men'. They are different in ways that behoove your consideration in terms of your roadside market operation.

For example, <u>women's armbones</u> are at a slight angle. They have difficulty turning the steering wheel of an auto for very sharp turns. One taxi company which employs both men and women drivers reports that the women drivers are responsible for 3 times as many crumpled fenders as men. This problem which women have with steering wheels was a factor in the innovation of power steering. And it is a factor important to you--make a wide smooth turn-off for your roadside market. Women don't like to make sharp turns and they have difficulty negotiating them. So, a good entrance to your market and the provision of adequate parking space are important factors both from a functional and psychological standpoint in consumer marketing at roadside markets.

<u>Women hear better than men</u>. They are more sensitive to sound, hence soft, sweet music is conducive to more sales whether it's in a store or at a roadside market.

<u>Women have a highly developed sense of smell</u>. They often judge products by sniffing them. That's why new detergents and cleaning products are perfumed. That's why baby oil must have a "baby smell." And your roadside market must smell like a fresh fruit and vegetable garden to motivate consumers to buy. If it smells of rotten fruit and garbage cans, you lose.

<u>Women have keener taste than men</u>. They like to taste things, hence the sales motivation value of food demonstrations in stores and the displaying of various items to taste and try at your roadside market.

<u>Women see better than men</u>. Research shows they have fewer eye defects than men-(color blindness occurs 8 times as often in men as it does in women). Women notice small details - untidiness, dusty items, rotted produce, fruit flies, dirty or broken windows, shabby buildings, peeling paint, saggy doors, trash strewn floors, untidy operators, shoddy background or landscape and the pot holes and puddles in your market driveway. Of course these things chase consumers away from your market and the opposites of these things are positive sales motivators.

Since women have sharp eyesight they are very conscious of colors and shades of color; that's why lipstick manufacturers supply their product in 101 different shades. Realization of this color factor is the reason why we now see pastel colors in soaps, tissues, appliances, shortenings and detergents.

Women often associate the quality of a product with the color of the package. In a coffee study, identical cups of coffee were placed opposite 3 different colors of coffee cans--dark-brown, golden-brown, and yellow. A large majority of the women who taste-tested the coffee said the cup opposite the dark-brown can was too strong, the one near the yellow can was too weak, the one beside the golden-brown can was best--although all the coffee was the same.

The fact that women are very conscious of color has implications for your roadside market operation. Landscape with colorful flowers, shrubs, and trees. Make displays to take advantage of the contrasting array of colors in your products.

Paint-up in bright pastel shades, use gay, colorful crisp, fresh looking packages and wrapping materials. Dress up your market with colored buntings, banners and colored lights, but don't detract or over do it. It can become offensive.

Women are more emotional and superstitious than men. They are more apt to live in two worlds--one real and one of fantasy. So that they have a stronger predisposition toward satisfying their many psychological needs, which takes me out of the realm of tangible factors that influence women's buying and into the area of desires, wants, and motives.

Middle aged women buy red convertibles because this gives them the feeling of being young. People are supposed to associate oranges with feelings of friendliness; grapefruits are associated with elegant reserve; and plain wrapped boxes of candy are more acceptable to calorie-conscious indulgers than candies in a fancy box. The dieter doesn't feel as guilty about buying them.

Today's ads are designed on the basis of these kinds of findings. A product is sold to cater to psychological needs as well as physical needs. For example, aspirin isn't really sold as medicine, it's now a sort of hormone to sweeten your disposition. Coke isn't just a drink, it's the phenomenon that makes things go better. Pepsi makes you think young, be sociable, and belong to the modern generation. Detergents put giants in washing machines and provide you with a knight in shining armor who is stronger than dirt; household cleaner creates a white tornado. Expensive soap isn't sold to wash a woman's dirty neck, it's to give her allure and make her squeaky clean all over.

The point is that in this new era of the consumer there is a lot more to a product or service than its physical characteristics. Any product and service including your roadside market is a whole bundle of attributes, physical and psychological. A whole cluster of ideas surround it.

So, consumers don't simply buy a product, they buy your products and a whole bundle of tangible and intangible attributes--a whole cluster of ideas that surround your products. They buy these products not only to satisfy physical needs, but equally important, they buy the whole bundle of attributes to satisfy various psychological desires, needs and motives.

One of the most important concepts in consumer psychology is that the consumer's response is not directly related to the Stimulus. It is related to the Consumer's Perception of the stimulus. Perception is the key factor. It's the Consumer's perception that counts. Perception in a broad sense, includes the notion of consumer desires, needs, motives, attitudes, preferences, expectancies and values--a whole slew of psychological factors. Some of these factors are :

(1) A desire for a feeling of security with respect to physical financial, and psychological well-being.

(2) A desire for recognition (emulation, devotion, superiority, ornamentation).

(3) A desire for new experiences (excitement, thrills).

(4) A desire for achievement or response (creativity, reward, reinforcement).

Build an image around your roadside market and your products that satisfy these desires, needs, motives, and people will more readily patronize your roadside market and buy your products.

Let me tie together some of these consumer desires, needs and motives.

The first step in attempting to motivate consumers is to examine your consumer market. Frequently we are quite sure we understand a situation even though we don't.

(1) Roadside Market Image. The image of your store or market is not what you think it is, but what other people think it is. We are back to the concept of consumer perception.

To project a favorable image your roadside market must meet people's desires or motives mentioned earlier.

Think about your market image.

Do you guarantee your merchandise?

What about weights and measures? (Shoppers feel better if a customer's scale is available to them - even if they don't use it. The presence of it creates confidence.)

Are the apples or peaches on the bottom of your pack "okay"?

Is every area clean? (Studies we conducted show that one untidy or dirty looking department can reflect an "unsanitary-health hazard" image of the whole store.) This makes the customer feel insecure about your foods. The same applies to a roadside market.

A carelessly groomed clerk projects the image of a slovenly store or roadside market. Keep yourself and your personnel fresh and clean looking as well as your products and your market.

If you sell eggs watch for broken ones that drip over the customer or her auto on the way home. Women have a real fear about transporting cartons of eggs; we found in a Houston study that this was the main reason for preferring cartons over-wrapped with cello-film. It was also a reason for buying eggs from door-to-door peddlers rather than at markets.

Can your customers walk up and down the aisles of your market without doing a two-step in and out between crates from which you are re-

filling the stock? Is your market littered with full and empty containers. Put them out of sight.

Price signs are important. Grocers call them shelf talkers. They tell the customer the prices without her having the embarrassment of asking you. People don't like to ask prices if there is a risk they won't buy that item. "Knowing" these things help consumers satisfy their need for achievement.

The highway signs and advertising that marks the approach to your market also projects an image. A Beverly Hill Billy effort with multi-size letters , wrong spelling, and runny paint smudges and a board or two hanging off the sign can hardly be expected to project an image of quality and imagination. Signs should be attractive, colorful, neat, and readable. Signs should give information immediately pertinent to the consumer who is driving past in an auto. Tell briefly what you sell, how far ahead your market is, which side of the road, and price information on one or two of your "special" items. Signs should be spaced along the highway well ahead of the approach to the market in sufficient numbers (say 3 or 4) to catch the glance of that 60-70 mph. driver. They should, at a distance, give time for the information to register with the customer and permit time to plan a turn off at your market. If possible, provide an extra "lane" for traffic to enter into and slow-down before turning. Sixty to seventy feet would be good. Mark this lane with a sign. Make the actual turnoff curve wide and smooth rather than a sharp turn. Provide adequate parking that doesn't block the drive-in area.

These things, together with lighting, landscaping, well-kept buildings and clean, well-groomed personnel are crucial to your roadside market image. They help meet the consumers' need for security, achievement, recognition and new experiences.

Project a favorable image of your roadside market through your appearance, your good manners, the market's cleanliness, and a tidy, gay, glamorous and exciting atmosphere. Your market can project an image which creates the consumer attitude that shopping is rewarding, pleasant, exciting and fun.

You might also consider the notion of combinations of enterprises in your roadside market--gift shop, refreshments, even children's pony rides or a "roadside zoo" that draw consumers to your operation because they are nearly always indulgent toward their children. Also, these things help give a roadside market a uniqueness in its bundle of attributes that could well attract families on their weekday, evening and Sunday afternoon drives.

What uniqueness of personality does your market have?

Does your market have the right face, the wrong face, or is it just a faceless nothing? It's how the consumer sees it that matters--consumer perception is the key.

Number and Variety of Products: This includes assortment of products. It includes the idea of bulk and non-packaged products versus prepackaging. You may need both. It involves the variety of package sizes. It involves the notion of what fruits and vegetables women especially come to a roadside market for, rather than going to the supermarket. Is it sweet corn at one season, strawberries at another, melons at a third? What are the items that are most favorable image projects for roadside markets? Find which ones and use them to the full in your roadside signs, ads, promotions, and displays.

Quality: So far as many consumers are concerned, quality is not based on grades and standards prescribed by a technical definition or the measurements of experts in the particular industry. It depends more on people's tastes, preferences and values. The point is that quality, as a motivating factor, must be defined in terms of your consumers and potential consumers.

Point of Sale Materials and Displays: Nearly two out of three of the consumer's final purchasing decisions are made right in the store at the point of sale. This is also true for most consumers patronizing roadside markets.

Here are some key factors when considering point of sale and display as a tool to motivate consumers.

(1) Your products should have that "fresh picked, high quality look" in a setting that complements this idea. Cull and restock after each rush of customers.

(2) Prices should be clearly displayed on all merchandise, and also names of items in some cases should also be included.

(3) Make displays look large enough to be seen from the road and to attract attention. This can be achieved without using a volume of products in the display that is too large for the sales volume of the item which would cause spoilage. The way to do it is to realistically dummy the core of the display and also tilt it for maximum display effect.

(4) Display highly perishable items on ice or refrigerated shelves. This prevents unnecessary spoilage as well as projecting a quality image and giving your customers a feeling of security in that you handle the products with care.

(5) Provide paper towels at the display for the use of customers who bag their own items. This helps meet the consumer recognition need.

(6) Most women are "waist to eye-level" shoppers. Display the items you want to "push" at this level.

(7) Point of sale colored posters are available from your fruit and vegetable organizations. Recipes and information on home handling, storage, and use are available for everything from home-made broth to

cherry tarts from USDA and various state universities. Much of this material could be used effectively at the point of sale, but isn't.

(8) Create a gay festive atmosphere at the point of sale by using streamers, crepe paper, banners and so on, however, don't overdo it. Exercise good taste--exercise restraint.

(9) Here are some general principles for effective displays and shelf talkers:

(a) Consider interest impact--headline, art work, make-up, size, color, etc.

(b) Use persuasive power--so that the consumer feels she has to have the product.

(c) Consider communication quality of your message--does it tell the consumer what she wants to know?

(d) Consider timing factor--display in harmony with the seasonality of the product and the time the consumer will derive greatest benefit from it.

(10) Ideas for Special displays:

(a) In summer, group picnic items on a picnic table. You could use mimeographed lists of items needed for picnics, beach parties or vacation.

(b) Use of shopping cart displays or other mobile displays. This permits changing items to customer traffic locations without disturbing customer shopping patterns.

Ads and Promotions are closely related to point of sale and displays in so far as consumer motivation is concerned. Roadside markets located around the outskirts of a specific city, town, or trading area, might develop cooperative ads in the newspapers--like supermarket food ads. This idea might even be developed along the lines of the Roadside Market Circle for a family auto drive. One special for each of the roadside markets could be advertised and a map of the "Magic Circle" complete with points of interest and attractions could be marked on the ad. This could cut the cost of advertising and establish a customer traffic pattern.

Personnel is a very crucial part of the total bundle of attributes you are merchandising at your roadside market. Be clean, including finger nails. Be appropriately well groomed. Be courteous. Be friendly. Be honest. Be sincere. Don't hound your customers like a private eye--simply be conspiciously available should they need help. Be informed about your products, their qualities, varieties, uses and storage problems. Remember the customer's needs for recognition, security, achievement, and new and pleasant experiences.

When people came together to trade and transact business they also wanted to exchange news and culture in an atmosphere of gaiety and liveliness. Today too many business people make the situation more and more impersonal, cold and drab. Your sales presentation, your approach, your communication should be new and interesting each time you wait on a customer. Your service and your approach should take the consumer out of the rut, away from the sameness of everyday life, and bring some measure of drama and glamor into the situation. Think about the things you say to customers. If we want to motivate we ought to put people in the right mood.

Remember, the typical woman shopper. "Drawn" from some 12,000 interviews, she has been profiled as follows:

"She is 35 years young, has two children and brings them with her to shop about half the time. Her husband makes a little under $6,000 a year. She spends about $1,200 of this on food. She drives two miles to the food store, passing another supermarket on the way, because people there don't seem helpful or polite enough.

"She does not carry a shopping list but uses the market itself as a reminder of what to buy. She changes brands often for no reason, and is a pushover for new items, whether foods or household gadgets. She lives to buy items that have recipes on the package. She changes stores from time to time to be a good shopper and for the excitement of trying something new.

"She loves trading stamps, coupons, and games of chance to satisfy her desires and needs for achievement, hoarding or gambling. She is an eye-level to waist-level shopper. Merely by moving a product 18 inches higher on the display rack, the merchandiser can increase its sales--and sometimes its price.

"Also, she likes to buy from filled rather than partially filled shelves. Except for those items she uses constantly, she cannot remember prices from day to day and her arithmetic is terrible. She invariably goes for 10¢ items sold three for 29¢. But she will also buy more of a 33¢ item if it is offered three for 99¢."

This is a quick profile of the consumer.

Roadside merchandisers, part of your job is to lie awake nights dreaming up new ways to woo and beguile the consumer. Set some tender traps for her and put an element of romance, glamor and excitement into the prosaic roadmarketing business. If your wife thinks you're being overzealous with these consumer women tell her you only love them for their money.

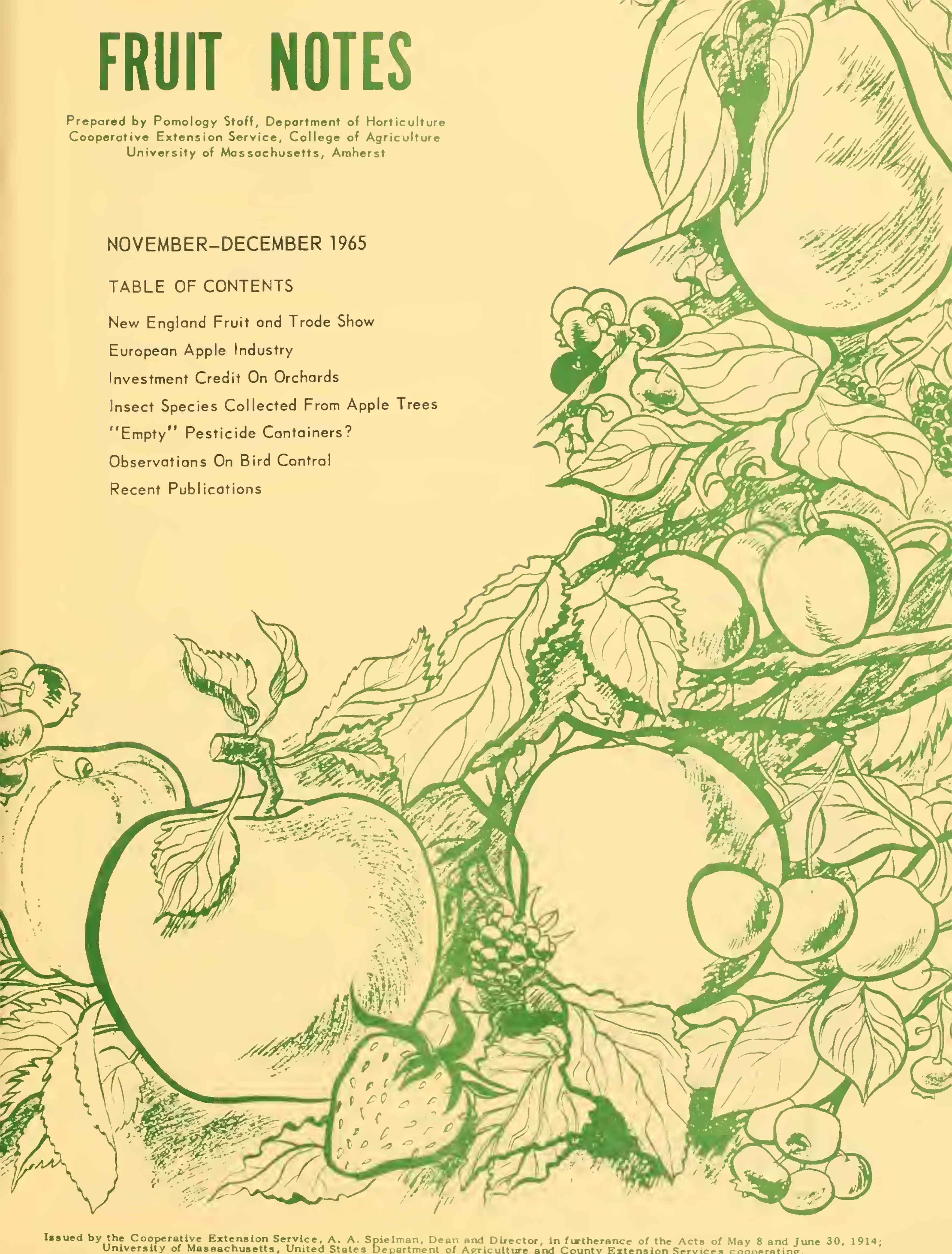
****

FRUIT NOTES

Prepared by Pomology Staff, Department of Horticulture
Cooperative Extension Service, College of Agriculture
University of Massachusetts, Amherst

NOVEMBER–DECEMBER 1965

TABLE OF CONTENTS



Issued by the Cooperative Extension Service, A. A. Spielman, Dean and Director, in furtherance of the Acts of May 8 and June 30, 1914; University of Massachusetts, United States Department of Agriculture and County Extension Services cooperating.
Publication Approved by Alfred C. Holland, State Purchasing Agent, No. 44.

NEW ENGLAND FRUIT AND TRADE SHOW

The New England Fruit and Trade Show of the Massachusetts Fruit Growers' Association, in cooperation with the Massachusetts Cooperative Extension Service, and with the Pomological and Horticultural Societies of New England, Massachusetts Department of Agriculture, the New England Apple Council and the New York and New England Apple Institute cooperating, will be held at Suffolk Downs, Boston, Massachusetts on January 5 and 6, 1966. The success of our first New England Fruit and Trade Show depends on your attendance!

The complete program is not available at this time. However, in addition to speakers from our own New England States, we have persons from Idaho, Pennsylvania, Illinois, Michigan, Washington, D.C. and Ottawa, Canada on the program.

The complete program will be mailed by the Massachusetts Fruit Growers' Association and also will be available from the County Extension Services.

Directions to Suffolk Downs: For those coming from west of Boston, take the Mass. Pike into Boston. At the last exit, follow the signs to Callahan Tunnel. Go through the tunnel and turn right. Follow Route C-1, North Shore. Suffolk Downs is on the right, off C-1 just prior to Texaco's gas tank farm.

From Southeastern Massachusetts and Rhode Island, take the Southeast Expressway to Callahan Tunnel.

For those coming from Essex County, southeastern New Hampshire and Maine, take Route 95 to Route 1. If using Route 93, follow this route to Route 128, then proceed north to Route 1. Follow Route 1 towards Boston. Where Route 1 comes into a rotary, follow signs that indicate C-1, Logan Airport and Sumner Tunnel. Follow C-1 through a number of rotaries, being careful to remain on C-1 (along this route C-1 joins with Routes 60 and 1A). Signs will indicate when you approach the Suffolk Downs area. Suffolk Downs will be on your left.

All pesticide chemicals mentioned in this publication are registered and cleared for the suggested uses in accordance with federal laws and regulations. Chapter 727, Acts of 1960, Commonwealth of Massachusetts requires that all pesticides sold in Massachusetts be registered with the Massachusetts Department of Public Health. Trade names, where used for clearness, do not indicate endorsement nor imply that similar products are not satisfactory.

WARNING! MOST PESTICIDES ARE POISONOUS. READ AND FOLLOW ALL DIRECTIONS AND SAFETY PRECAUTIONS ON LABELS. HANDLE CAREFULLY AND STORE OUT OF REACH OF CHILDREN, PETS AND LIVESTOCK

EUROPEAN APPLE INDUSTRY

William J. Lord
Department of Plant and Soil Sciences

An article in the May 10, 1965, issue of Foreign Agriculture by Gilbert E. Sindelar, Fruit and Vegetable Division, Foreign Agricultural Service and entitled "What's Happened to Our Apple Market in Europe - and Why" contains many facts of interest.

Prior to World War II, the United States was the world's largest exporter of apples for fresh use. We now rank about sixth. In terms of volume, total export has decreased from an average of 10 million bushels in the 1930's to a little over 3.5 million bushels in recent years. During this time, export of apples to Western Europe, our major market, has decreased from 8.5 million bushels to an average of about 2 million bushels.

According to Mr. Sindelar, the reasons for this loss of the Western European market trace back to the period immediately following World War II.

"War had crippled the exporting industries of most European nations, seriously limiting their ability to earn dollars with which to pay for needed imports. This prompted, in some cases, the complete prohibition of imports, including apples. Today, most of Europe is enjoying a high level of economic well-being, but despite this, the opportunities for furthering U.S. trade in apples to anywhere near prewar levels have been dimmed by the rapidly increasing self-sufficiency of the European market.

With only a very few exceptions, the apple industry in Western Europe has expanded greatly, and this growth has been largely a postwar development accomplished under the veil of protectionism. Although it is recognized that the dollar exchange shortages are no longer a valid argument for the maintenance of trade barriers, political pressures from the home front have fostered a continuation of restrictions. The frontiers of many European countries still remain closed to imports, either wholly or partially, until the marketing of locally produced fruit has passed its peak."

Italy now leads in production

Due to a spectacular increase in apple production within a relatively short period of time, Italy now leads Europe in apple production. Before World War II, Italy averaged only about 13 million bushels of apples a year. By the early 1950's, average production had risen to 36 million bushels and, in 1964, production reached a new high of 108 million bushels.

Most of the post-war expansion in Italy's apple production has taken place in the Po Valley which now produces more apples than did the whole of Italy in 1940.

American-type varieties are important in the post-war plantings. These include 4 different sports of Red Delicious, Golden Delicious, Rome Beauty, Jonathan, Winesap and Gravenstein and they accounted for 41% of the 1963 apple crop in Italy.

According to Sindelar, planting activity appears to have subsided in Italy and interest in other fruits such as pears and peaches has increased.

France Production Increase Spectacular

Ten years ago, France produced about 20 million bushels of apples for dessert purposes. Production now has increased to approximately 45 million, and within a few years, crops in excess of 60 million bushels are anticipated.

Golden Delicious plantings have been extensive and now account for nearly one-half of the total crop of apples for dessert purposes.

Prior to World War II, France was a market for a million bushels of apples from the United States. Now, the U.S. exports virtually no apples to France.

Apple Industry Expanding in Belgium and Netherlands

By 1970, apple production in Belgium may be 50% larger than the present 7 to 8 million crop.

Before World War II, the Netherlands produced an average crop of 3.5 million bushels; in 1964, a 17 million bushel crop was harvested. Only a moderate production increase is anticipated in the future, however.

Golden Delicious is the leading variety in new plantings in Belgium and the Netherlands.

Moderate Planting Increase in West Germany

A moderate increase in new apple plantings has occurred during the last 10 to 15 years in West Germany. Little change in production is anticipated, however, because of removal of older plantings.

Prior to 1960, West Germany often was the leading apple producer in Europe and since yearly production varied considerably, it used to have a marked effect on the overall European crop. The production increases in Italy and France tend to dwarf the impact of a short crop in West Germany.

Contrary to the other European countries, the varieties planted in the new orchards in West Germany have been those of European rather than American origin.

The United Kingdom - Our Best Pre-war Customer

Apple production in the United Kingdom has almost tripled since the 1930's, rising to nearly 30 million bushels in 1963.

Cox Orange Pippin is the most prominent variety being planted.

****

INVESTMENT CREDIT ON ORCHARDS

Lawrence D. Rhoades and Earl I. Fuller
Department of Agricultural and Food Economics

Amendments to the Internal Revenue Code which became effective in 1961 provided for a special direct federal income tax credit for qualified investment in certain property used as an integral part of "manufacturing, production, or extraction."

The property must be tangible personal property or other tangible property, must be depreciable property and must have a useful life of four years or more.

Income tax regulations include the cultivation of orchards in the terms "manufacturing," "production" and "extraction."

New property which would qualify for investment credit includes property purchased after December 31, 1961 and where the original use of the property commences with the taxpayer and commences after that date.

Used property would include all other property that meets the tests but is not new property.

The determination of whether the property qualifies must be made with respect to the first taxable year the property is placed in service.

Property is considered as placed in service in the taxable year in which the property is placed in a condition or state of readiness and availability for a specifically assigned function or the year in which depreciation begins, which ever is earlier.

Fruit bearing trees and vines are not considered to be in a state of readiness and availability or subject to depreciation until they have reached an income producing state.

All expenditures to bring orchard trees and vines to a producing state should be capitalized and thereafter a fair and reasonable annual allowance for depreciation is permitted.

If John Fruitgrower purchased 20 acres of bearing orchard in 1965, for $12,000 and 10 acres of 3 year old orchard for $2,000, he would allocate part of the purchase price to the land and part to the trees: the arithmetic might go like the following:

Bearing orchard land, 20 acres		$ 2,000
15 year old trees		10,000
Estimated remaining life on trees		15 years
Investment credit on	$10,000 used property	
	7%	
	$ 700 tax credit	

Depreciation straight line $\frac{10,000}{15} = \$667 =$ annually

Three year old orchard land value, 10 acres		$ 1,000
Growing trees	$ 1,000	
add expenditures (capitalized) to bearing age 1970	3,000	
		4,000

Trees qualify as new property in year of bearing 1970.
Estimated life 1970-1990.

Investment credit 1970	$4,000
	7%
	$ 280 tax credit

Depreciation $\frac{\$4,000}{20 \text{ years}} = \$200$ per year annually (Beginning in 1970)

Orchard trees and vines qualify for investment credit either as new or used property if purchased.

In the case of additional orchard plantings such property qualifies in the year of bearing; its cost is the capitalized value of the trees at the time, for depreciation purposes and this cost is the amount which is used for determining investment credit.

****

INSECT SPECIES COLLECTED FROM APPLE TREES

H. E. Wave
Department of Entomology and Plant Pathology

Fruit growers may be interested to know that at least 763 species of insects have been identified from insect collections taken from apple trees. Only a small number of these insect species are of economic importance to the industry.

An ecological study of insect populations on apple, conducted in Wisconsin by Dr. E. R. Oatman et al. and published in the December 1964 issue of the Journal of Economic Entomology, showed this number of species to be present on apple. A mature, isolated block of 3 acres, containing Snow, Greening and Wealthy, was used in the study, which covered a period of 4 years. The insect fauna was surveyed weekly beginning at the Silvertip Stage and continued until frost. Survey methods included limb-jarring; sampling of leaves, spurs and terminals; trunk-banding; and sticky-board and black-light trapping.

In the study, a total of 43 species were considered economically important to the apple crop. About half the species (22) reported to be injurious to apple were lepidopterous (moth) species. In addition to the 43 injurious species, many species were predaceous or parasitic on other insects, i.e. they were beneficial.

****

"EMPTY" PESTICIDE CONTAINERS?

E. H. Wheeler
Department of Entomology and Plant Pathology

An "empty" pesticide container is NEVER "empty!"

That's not a joke! It could be very serious!

Did you ever get all the powdered pesticide out of a paper bag or a drum? Of course not; nobody does!

Did you ever get those last few drops of liquid pesticide out of a can, drum, pail or bottle? Not without rinsing and even then you didn't get out all the rinse water; and just rinsing does not remove some pesticides!

"Empty" pesticide containers are dangerous to have around - even for a short time. Most of them contained concentrated - not dilute - pesticides. Some contained highly poisonous and/or volatile chemicals.

It's too easy for someone to put food, feed or drink into that "clean" pail or bottle that's handy!

Common sense should tell you to get rid of those "empty" pesticide containers soon and so as to not create a further hazard.

You could be legally liable if someone is injured or made ill because you have let "empty" pesticide containers stay around.

Here are some guide lines:

1. Follow any directions for disposal that you find on labels.

2. Burn combustible containers (except containers of hormone-type weed killers. 2,4-D, etc.) in a public or commercial incinerator or a place approved by the local Board of Health (even if on your own land). Keep everyone out of the smoke.

3. Bury ashes from burning and all non-returnable containers (after carefully breaking, puncturing and or crushing) at least 18 inches or more deep in a public dump (notify the supervisor) or on private land at a site approved by the local Board of Health (even if on your own land). Such a site must not be on a public water supply watershed, where any stream may become contaminated or where the buried material is likely to be disturbed.

****

OBSERVATIONS ON BIRD CONTROL

Dominic A. Marini
Regional Agricultural Specialist

Avelina Tavares, who grows 7 acres of cultivated blueberries in Acushnet (Bristol County), has found the New York starling trap helpful in reducing bird damage to his crop.

Mr. Tavares used 3 of the traps in his plantation this year. The number of birds caught varied from day to day; he caught more than 100 on some days, mostly starlings and grackles. For bait he used corn, bread crumbs or rice and he found cooked macaroni also an effective bait.

Although the traps do not eliminate all bird damage, Mr. Tavares feels that they have reduced it substantially. He strongly urges other growers to build traps also, in a campaign to reduce the population of destructive species of birds. Plans for the trap are available from the U.S. Fish and Wildlife Service or your County Extension Service.

David Grindle, owner of "Blueberry Haven", a 3 1/2 acre cultivated blueberry plantation in Hanson, believes that protecting his crop from bird damage with netting has doubled his yield. In 1965, he harvested more than 20,000 quarts, while the largest previous crop without netting was 10,000 quarts.

Grindle is protecting his crop with used fish netting - he prefers the rayon to the cotton. This is the fourth year for the rayon and he thinks that it will last for at least 2 or 3 more years, while the cotton does not stand up as well.

Costs are estimated as follows: netting $2,000, wire $100, used 1 1/4" pipe $200 - plus family labor. Holes for the pipes were punched with a crowbar and then they were driven in with a sledge hammer. Four holes were drilled in the top of each pipe and the wires were run through them. Plastic cups were placed over the ends of the pipes to prevent the net from catching and tearing. Four men put up the net in one week.

Some growers have felt that the cost of nettings is prohibitive, that it doesn't pay. But when there is a possibility of doubling your crop, can you afford not to net?

****

RECENT PUBLICATIONS

You may wish to send for one or more of the following publications:

1. Market Your Fresh Apples. USDA Marketing Bulletin No. 35. Available from Office of Information, USDA, Washington, D.C. 20250

2. Influence of Certain Fungicides on Apparent Photosynthesis of an Entire Apple Tree. Bulletin 629. Available from Maine Agricultural Experiment Station, Orono, Maine.

3. Diseases and Insect Pests of Raspberries and Other Cane Fruits. Publication 880. Available from Information Division, Canada Department of Agriculture, Ottawa.

4. Observations on Winter Injury to Apple and Pear Trees in the Hood River Valley. Station Bulletin 595. Available from the Agricultural Experiment Station, Oregon State University, Corvallis.

5. Management and Cost Control in Producing Apples for Fresh Market. Bulletin 1001. Available from Agricultural Experiment Station, Ithaca, New York.

****

FRUIT NOTES

Prepared by Pomology Staff, Department of Horticulture
Cooperative Extension Service, College of Agriculture
University of Massachusetts, Amherst

JANUARY–FEBRUARY 1966

TABLE OF CONTENTS

Issued by the Cooperative Extension Service, A. A. Spielman, Dean and Director, in furtherance of the Acts of May 8 and June 30, 1914; University of Massachusetts, United States Department of Agriculture and County Extension Services cooperating.
Publication Approved by Alfred C. Holland, State Purchasing Agent, No. 44.

NEW APPLE VARIETIES FOR TRIAL IN MASSACHUSETTS

W. D. Weeks
Department of Plant and Soil Sciences

<u>Quinte</u> Appears to be the better of three early varieties developed by the Central Experimental Farm, Ottawa. Fruit is attractive and well-colored. Quinte bears annually but may require thinning for adequate size.

<u>Niagara</u> An attractive McIntosh type apple which ripens two weeks before McIntosh. It is similar to McIntosh in its growth habit, productiveness and appearance.

<u>Spartan</u> A promising new variety from British Columbia. Fruit has good color and quality but has tendency to small size. Tree is vigorous and of good structure, annual, will pollinate McIntosh.

<u>Idared</u> Attractive, bright red winter apple. Good quality and size. Dessert and cooking. Tree productive, annual, worthy of extensive trial.

<u>Spencer</u> Fruit attractive, bright red, quality excellent, good for dessert and pie. Tree hardy, productive, annual.

<u>Mutsu</u> Golden Delicious type fruit which is less susceptible to fruit russeting and storage shrivel. Tree vigorous and productive, triploid-pollen not viable. Possible substitute for Golden Delicious.

<u>Ruby</u> An attractive Rome type apple. Fruit has good size and color, quality average. Tree has poor branch structure.

<u>Jerseyred</u> A late Rome type apple from the New Jersey Agricultural Experiment station. Fruit large, well-colored, better quality than Rome. Jerseyred has triploid-pollen.

****

POMOLOGICAL PARAGRAPH

<u>Virus-free Red Raspberry Plants</u> - For those who have been waiting for virus-free red raspberry plants, it appears that a few will be available this year. One nursery has a limited supply of Latham.

****

HARVESTING SEQUENCES OF NEW PEACH VARIETIES

W. D. Weeks
Department of Plant and Soil Sciences

The following new varieties are listed in their approximate order of harvesting:

Sunrise
Sunhaven
Coronet
Goldgem
Washington
Richhaven
Glohaven
Redqueen
Cresthaven
Madison
Blake
Jerseyqueen
Jefferson

This list provides a harvesting season of about 7 weeks, commencing with Sunrise, which is 44 days ahead of Elberta and ending with Jefferson, which is 3 or 4 days past Elberta. Descriptions of these varieties have appeared in past issues of Fruit Notes.

****

PLUM VARIETY EVALUATION - 1965

J. F. Anderson
Department of Plant and Soil Sciences

The following is a report of the performance of some plum varieties in our Amherst orchards in the summer of 1965. Of these, Formosa, Santa Rosa, Yakima and Stanley are currently recommended for commercial planting. Growers planning a new plum orchard must give consideration to the problem of pollination. To insure successful pollination, it is advisable to plant more than one variety of a particular type: namely, two or more Japanese varieties or two or more European varieties. Readers are referred to Special Circular No. 247 for a more complete discussion of the pollination problem.

<u>Burmosa</u> A Japanese type plum introduced by the California Experiment Station. The tree is small in size, medium in vigor and tends toward biennial production. The fruit is attractive, yellow with a bright red blush, becoming completely overlaid with red, medium to large in size, of good quality and a freestone. The fruit was ripe about July 23, and held well in storage. Burmosa appears promising.

Methley — A Japanese type plum that ripens with Burmosa. The fruit is small, dark red, red-fleshed and fair to good in quality. Methley does not appear promising under our conditions.

Brilliant — An introduction of the Missouri Experiment Station. This Japanese plum ripens with Formosa. It is red in color and of good size and quality. Brilliant is more productive than Formosa, but is inferior to Formosa in size, quality and appearance.

Formosa — A Japanese type plum that ripens in early August. The fruit was tree ripe on August 10, this year. The tree is large, vigorous and moderately productive. The fruit is large, attractive and the yellow color tends to be completely overlaid with red as the fruit ripens. The quality is very good. Formosa holds up very well in storage.

Great Yellow — A Japanese type plum that ripened in the second week of August. Production this year was moderate. The fruit of Great Yellow is medium to large in size, good quality and a freestone. The fruit hangs well on the tree, but there is a tendency for the skin to pull away at the stem when the fruit is picked late. This variety was rated high in flavor by all who tried it, but there may be some buyer resistance because of its color.

Shiro — A Japanese type plum that ripens with Great Yellow. Shiro is a very attractive bright yellow plum. The trees tend to be biennial in bearing and thinning may be necessary to attain good size. Production was good this year. Great Yellow has been superior to Shiro in size and flavor.

Santa Rosa — A large, reddish-purple Japanese plum of good quality. The tree is large, vigorous and moderately productive. Santa Rosa ripens about a week later than Formosa. The fruit keeps and ships well.

Washington — A large, high quality Gage plum ripening in late August. The trees in our Amherst orchards have been very productive. The color of this European plum is not especially attractive and there could be some resistance by those unaware of its excellent flavor.

Howard Miracle — A large, attractive, high quality Japanese plum. The fruit is golden yellow with a light red blush. The firm-fleshed, freestone was picked in late August. Production was very good this year. The flavor of this variety is not typical of a plum and might be objectionable to some.

Pacific — An attractive, blue prune type plum of good quality. The fruit is quite firm and the keeping quality is excellent. Pacific has been a good cropper in Amherst, but ripening is quite uneven. The fruit begins ripening in the second week of September. Pacific is a European type plum.

Yakima — A European type plum that ripens in late August. The fruits are large, prune-shaped, reddish purple, freestone and of good quality. This variety has been only moderately productive in our trials.

Redheart — A Japanese type plum that was introduced by the California Experiment Station. Redheart has proven to be a very good producer of medium-sized, heart-shaped, red-fleshed plums. The fruit has not developed satisfactory flavor in our orchards. Redheart ripens in the third week of August. This variety is said to be a very good pollinizer for other Japanese plums and may prove valuable for that purpose alone.

Elephant Heart — The fruit of this variety is large, dark red and heart-shaped. The flesh of this Japanese type plum is firm, blood-red in color and good in quality. The tree is large and vigorous. Though Elephant Heart has tended to be a light producer in the past, its yield was very good this year. Elephant Heart ripens in early September and would be a desirable variety if yields can be maintained.

Stanley — An attractive prune type plum which is suitable for both fresh use and canning. The fruits of this European plum are blue in color, medium to large in size. The flesh is greenish-yellow, juicy, firm and of good quality. Stanley is a freestone that ripens in the second week of September. The tree is both productive and annual. Those growers wishing a similar type plum for an earlier market may wish to consider New York 795 or New York 797.

****

POMOLOGICAL PARAGRAPHS

Chemical weed control - Orchard help removing grass and weeds from around the base of fruit trees, was a common sight in orchards in November. Much of this laborious task can be eliminated by chemical weed control, since a number of herbicides are labelled for use in apple and pear orchards and 3 materials are labelled for peach orchards. More growers should make use of these materials to eliminate hand mowing and as an aid in the mouse control program.

****

Plastic containers for cider - Because of the difficulty and expense of sealing plastic-coated cartons, the use of half-gallon plastic jugs as containers for cider was an innovation at many roadside stands this fall. Consumer acceptance of this container appears to be good.

****

PEAR VARIETY EVALUATION - 1965

J. F. Anderson
Department of Plant and Soil Sciences

There appears to be increased interest in growing pears in Massachusetts, particularly by those operating roadside stands. It is hoped that the information presented in this article will be of value to the potential growers of pears. Harvest dates and pressure test readings mentioned in the write-ups are for the 1965 harvest season and are given as a point of interest only. Harvest dates will vary from season to season and orchard to orchard. The pressure tests were made with a Magness-Taylor pressure tester, using a 5/16" diameter head in contrast to the 7/16" diameter head used for apples. The following 7 varieties have been recommended for commercial planting in Massachusetts for a number of years.

Clapp Favorite The fruit is large, greenish-yellow with a blushed cheek and good in quality. The fruit has a high susceptibility to core breakdown if picked late. The fruit is usually ready for harvest in mid-August in Amherst. The tree is hardy and productive, but it is highly susceptible to fire blight*.

Bartlett A medium to large, attractive, high quality pear. Bartlett is picked in late August or early September. We picked Bartlett on August 27, when the average pressure test reading was 20 pounds. The tree is medium in size and is productive.

Gorham A seedling of Bartlett which it resembles in size and color. The flesh is white, tender and juicy. Unlike most pear varieties, the fruit will ripen in cold storage. Last season the fruit held up well in storage until the end of January. The fruit was harvested on the 3rd of September when the average pressure test was 13 pounds. This fruit was eating ripe in cold storage in early December. Gorham is said to require a higher level of nutrition than Bartlett to maintain production.

Seckel A popular variety for pickling. The fruit is small, often with a bronze russet and very high quality. The tree is large, upright spreading, and productive in alternate years.

Flemish A large attractive, high quality pear. The fruit was picked September 3rd, when the average pressure test was 12 pounds. Flemish is susceptible to pear scab, but this can be readily controlled with present fungicides. The tree is large vigorous, very hardy and productive in alternate years.

Bosc This russeted pear is harvested in late September. The fruit was picked September 22nd, when the average pressure was 14 pounds. The crop was very heavy and there was some fruit drop. The fruit is large and has excellent flavor

when ripened properly. Stored fruit was in excellent condition in late December. The tree is productive with a slight tendency towards biennial bearing.

Anjou — A late ripening pear of large size and good quality. Anjou is a good shipper and a good keeper. The fruit was picked with Bosc and the pressure at the time of harvest was 13 pounds. The trees are large and have been good producers. Anjou is often reported to be a shy producer.

The following 8 varieties appear to be worthy of trial.

Early Seckel — A seedling of Seckel that resembles its parent in coloring but tends to be larger and to have a more distinct neck. The fruit is attractive, very good in flavor and keeps well for an early fall variety. The fruit was picked August 19th, the pressure test averaged 14 pounds on this date. The tree is medium in size, vigorous and productive.

Devoe — The fruit is a clear yellow with a blushed red cheek, oblong pyriform in shape and with good quality. Devoe is a heavy producer, but the fruit tends to ripen unevenly and to be variable in size and coloring. Thinning might be desirable. The fruit was picked September 3rd when the pressure was 13 pounds.

Ewart — The fruits are large, yellowish-green with some russeting and good flavor. Ewart is less attractive than Barlett. The fruit was picked September 3rd, with an average pressure test of 18 pounds. Ewart has been moderately productive in our orchard. Fruit ripened in late December developed good flavor and texture.

Dumont — A late ripening pear of medium to large size. The flesh is firm, juicy and the quality very good. The fruit was harvested September 22nd, and at that time the pressure test averaged 13 pounds. Fruit ripened in late December developed good flavor and texture.

Starkrimson — A red bud sport of Clapp Favorite. The fruit is similar in size, shape and quality to Clapp, but has a solid red surface color. The fruit was harvested August 20th and held up well in storage to early December. This variety would add color and interest to a pear display, but we are not certain as to the buyers' reaction to a red pear.

Grand Champion — A russet sport of Gorham, which it resembles in size, shape and quality. The fruit is overlaid with a uniform cinnamon russet and is very attractive. The trees in our planting are too young to evaluate as to productivity.

Alexander Lucas — A late ripening pear of medium size, smooth surface and a greenish-yellow color. The fruit is of good quality.

Alexander Lucas was harvested September 22nd and continues to hold up well in storage in late Decmber. Production has been good.

Packhams Triumph The fruit is large greenish-yellow and although the surface is somewhat rough, it is an attractive pear. The flesh is white, fine, melting, free of grit cells and of very good quality. The fruit was harvested with Anjou and Bosc this season. Fruit ripened in late December developed good flavor and texture. We are unable to evaluate this variety as to production and other tree characteristics as our source of fruit was from a top-worked tree.

*We experienced a mild outbreak of fire blight in our College orchards this summer for the first time in many years. Varieties affected included Clapp, Dumont, Phelps, Bartlett and Caywood.

****

STRAWBERRY VARIETY EVALUATION - 1965

J. F. Anderson
Department of Plant and Soil Sciences

Among the newer varieties that one might consider for planting in Massachusetts are Fulton, Frontenac, Fletcher, Garnett, Midway and Vesper.

Since the performance of a strawberry variety is greatly influenced by climatic soil and cultural conditions, it is suggested that growers test any new variety on a small scale before planting it on a commercial basis.

Fulton A mid-season variety which has performed very well in Amherst. The plant is vigorous, a good runner producer, very productive and free from leaf diseases. The fruit is medium in size, attractive, very firm and of very good flavor. Fulton is not resistant to red stele.

Fletcher The plant is vigorous and a good runner producer. The yield is good. The fruit ripens in the late mid-season, is large, firm, attractive, very good in flavor and is said to be an excellent freezer.

Garnet This variety was recently named by the New York Agricultural Experiment Station. We have tested Garnet as N. Y. #430 for several years. The plants are vigorous, forming a full bed and have been productive. The berries are large, attractive moderately firm and have a good flavor. Garnet is of the Sparkle season and is not resistant to red stele.

Frontenac — The fruit is large, medium to dark red in color, attractive, good in flavor and moderately firm. Frontenac is said to be excellent for freezing. The plants are large and form sufficient runners for a good bed. Frontenac is susceptible to drought, which could account for its failure to reach its full yield potential in our trials last summer.

Midway — A mid-season variety ripening with or slightly before Catskill. The plants are vigorous, good plant makers and very productive. Midway is resistant to the common race of red stele, but may show some mildew. The fruit is medium to large, deep red, glossy, attractive and very good in flavor. Variable size and a tendency for green tips has been noted in past trials. Midway is well worth trial in commercial quantities, especially in soil where red stele has been a problem. Midway performs best on soils of good moisture holding capacity.

Vesper — The plant is large, vigorous and a good runner producer. The fruit ripens very late, two to three days after Jerseybelle. Yields have been considerably higher than Jerseybelle in our Amherst trials. Vesper is a little darker than Jerseybelle, is very large in size, has prominent yellow seeds and a glossy skin, all of which make it very attractive. The fruit is moderately firm and good in flavor. Limited observations by growers indicate that berries should be harvested while light red in color. Dark berries may be soft and non-marketable. This variety merits trial because of its lateness, productivity, large size and attractiveness. It should not be planted where red stele is a problem.

Data as to season, berry size and yield for some of the more important varieties that were included on 1965 trials will be found in the following table. Yields and other fruit characteristics were greatly influenced by a deficiency of rainfall both in the 1963 and 1964 seasons.

Variety	Season (1) % Early	% Late	Berry Size (2) 1st	3rd	5th	Number of Pickings	Calculated Yield Quarts per Acre
Midway	13	0	410	311	223	6	11,340
Catskill	6	9	394	360	244	7	10,764
Sparkle	0	15	296	239	173	6	5,309
Garnet	0	27	492	305	200	6	7,156
Fulton	0	31	345	291	174	6	5,772
Fletcher	0	38	365	295	163	6	8,523
Frontenac	0	41	342	328	240	6	6,686
Vesper	0	65	526	410	264	6	6,652

[1] Season June 11 to July 6 (11 pickings)
%Early - percentage of total crop of each variety picked in first 3 pickings.
%Late - percentage of total crop of each variety picked in last 3 pickings.
[2] Berry size - average weight in grams of 25 berries.

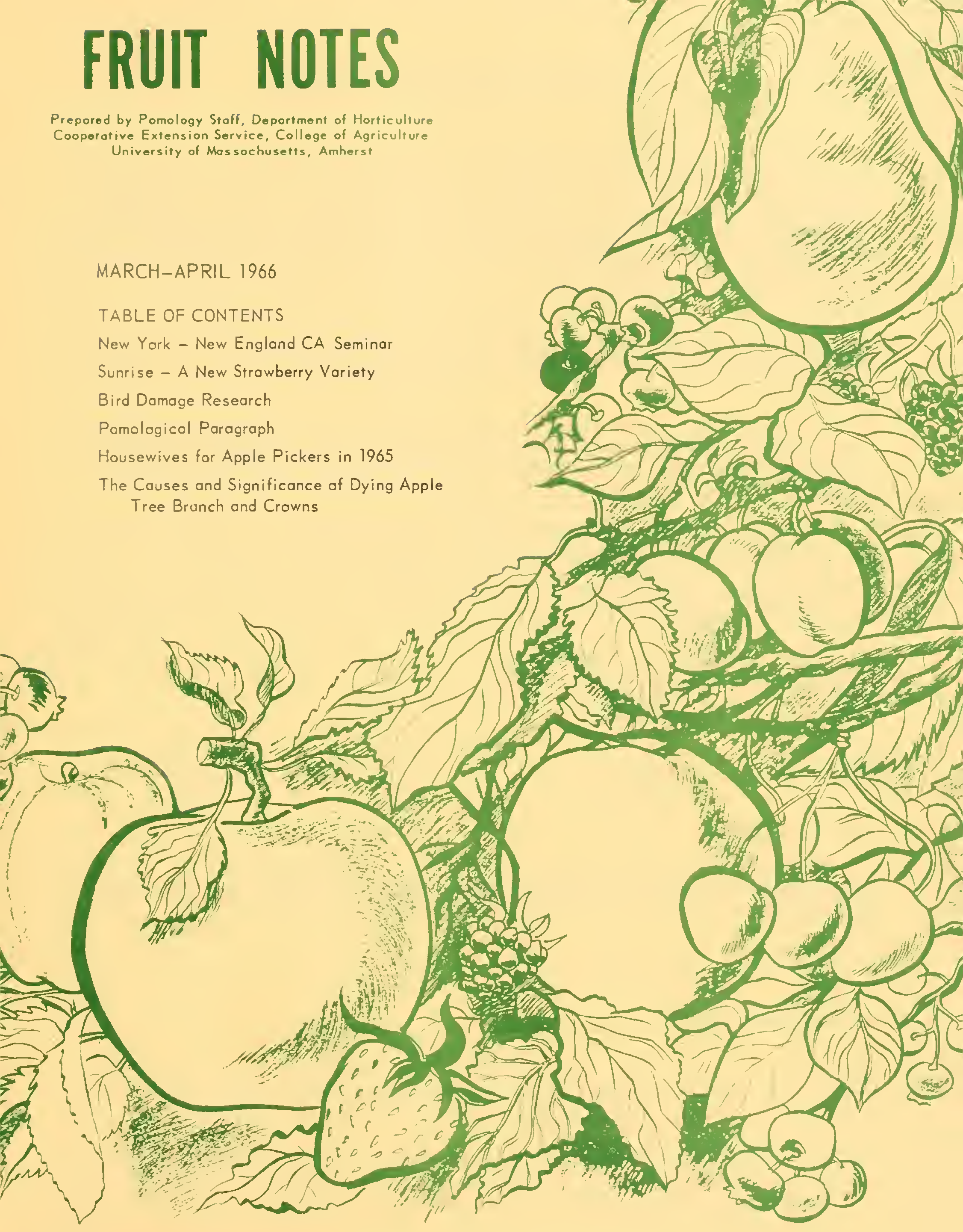
****

FRUIT NOTES

Prepared by Pomology Staff, Department of Horticulture
Cooperative Extension Service, College of Agriculture
University of Massachusetts, Amherst

MARCH–APRIL 1966

TABLE OF CONTENTS



Issued by the Cooperative Extension Service, A. A. Spielman, Dean and Director, in furtherance of the Acts of May 8 and June 30, 1914; University of Massachusetts, United States Department of Agriculture and County Extension Services cooperating. Publication Approved by Alfred C. Holland, State Purchasing Agent, No. 44.

NEW YORK - NEW ENGLAND CA SEMINAR

The CA Storage Seminar, which has become a biennial event, is scheduled for April 28, at the Student Union Building of New Paltz State College at New Paltz, New York. These seminars which are a cooperative effort of the Extension Services and research staffs of the Colleges of Agriculture of New York and the New England states, have proven to be a successful method for keeping growers and industry informed of the latest CA storage developments.

Registration for the CA Seminar will be at 9:30 in the foyer of the Student Union at New Paltz State College. The registration fee of $3.50 will cover costs of refreshments, lunch and publication of the proceedings.

You will be sent a copy of the proceedings if you attend the seminar. If you cannot attend, but would like a copy of the publication, it may be purchased upon request. Enclose a check payable to the Department of Pomology, Cornell University, Ithaca, New York, for $1.00.

If you do plan to attend, please fill out the form below. Dr. R. M. Smock needs to know how many are coming to plan the luncheon.

Do not send payment with the form below. Payment will be made at registration time.

Tear off form below and mail to R. M. Smock, Department of Pomology, Cornell University, Ithaca, New York.

....

Name ______________________________

Mailing Address ______________________________

If you want to use this form for other names and addresses, list them below.

Name ______________________________

Mailing Address ______________________________

Name ______________________________

Mailing Address ______________________________

SUNRISE - A NEW STRAWBERRY VARIETY

J. F. Anderson
Department of Plant and Soil Sciences

Sunrise, a new red stele resistant, early ripening strawberry variety, developed cooperatively by the Maryland Agricultural Experiment Station and the United States Department of Agriculture, is now available to growers. The variety was named and released to nurserymen in November, 1964, so that the supply of virus-free plants could be increased and made available to growers in the fall of 1965.

Sunrise was tested from Massachusetts to North Carolina and westward to Missouri. The variety was most satisfactory in the southern Midwest portion of the United States.

Sunrise is resistant to 3 races of the red stele fungus and to Verticillium wilt. The leaves are resistant to leaf scorch and mildew, but very susceptible to leaf spot.

We fruited Sunrise in our experimental plots in Amherst in 1958, 1959, 1960 and 1961. The fruit, under our conditions, was bright red, glossy, smooth and uniform in shape. The size was medium to small and variable. The plants were vigorous and made a good bed. The yield, as related to other varieties under trial at the time, was fair. A comparison of Sunrise and Midway growing under similar conditions is offered:

	Sunrise qts./acre (1)	Midway qts./acre (1)
1958	6,933	8,929
1959	4,719	8,712
1960	8,820	10,563

(1) This is a calculated yield.

Sunrise did not appear to be especially promising under our Amherst conditions. However, it may be worth testing where an early ripening variety is desired and red stele is a problem.

****

BIRD DAMAGE RESEARCH

David H. Hirth, Graduate Assistant
Department of Forestry and Wildlife Management

For the last four years a concentrated effort has been made to investigate the basic ecology of the robin here in Amherst. Interest in

this type of study was stimulated by the work of Richard N. Smith, who found the robin to be a primary source of damage to fruit crops by birds in the state of Massachusetts. Smith, working in cherry, blueberry, and grape plantations at the University, noted that there was practically no population turnover at times when the fruit crop was ripe. Experiments with various scare devices were run with little or no success. For this reason Smith recommended that a great deal more fundamental information on the daily lives and activities of species responsible for fruit damage was needed before any effective, economically feasible, control measures could be proposed.

In the last two summers the robin project has been aimed simply at studying the ecology of this bird, rather than studying its habits with regard to fruit depredation specifically. The basis for this work has been a population of wing-tagged individuals. Three hundred and twenty birds were tagged in two summers. The tags, devised by A. E. Hester, were circular with a diameter of 1 1/2 inches and made of plasticized cloth attached to each wing by means of an aluminum poultry clip. Combinations of letters painted on these tags enabled me to identify an individual bird at a range of 100 yards with a 20 power telescope.

Observations of tagged birds at the University cherry orchard and two blueberry plantations completely corroborate those of Smith with respect to age group and population turnover. After the second week in June immature birds, rather than adults, caused most of the damage. In 1964, 31% of the immatures captured at the cherry orchard were seen feeding there again; and 49% of the immatures captured at one blueberry plantation were seen feeding there again. It is safe to assume that the actual number returning to these sites was far higher than these figures indicate. As an indication of the strength of the affinity these birds have for a particular fruit plantation, it is interesting to note that being captured in nets, banded and wing-tagged in no way acted as a deterrent to their returning.

The first wave of nestling robins is ready to leave the nest during the last ten days of May. The fledglings remain in the immediate vicinity of the nest for 2-3 weeks depending on the cover available. In most cases these fledged immatures then move quickly to the nearest fruit crop, wild or cultivated, and become part of a flock of robins centered on this source of abundant food. The flock is composed primarily of immatures, but also contains adults that have been released from nesting duties. The adults tend to wander more widely, however, and are less predictable in their movements than are the young birds. Fledglings generally did not travel further than a half mile to join a local feeding flock.

Very little is known about how the actual dispersal of fledglings or immatures from nests takes place. Do they move on their own initiative or are they led to feeding areas by parents? Immatures are often seen at feeding areas begging food from adults. Whether these adult birds are the parents of the begging fledglings is open to question. Observations of tagged immatures this spring indicated that some birds find their way to feeding areas by themselves and some by following parents. One immature that had moved away from its parents' territory

was seen at the University cherry orchard a week later, and probably arrived there with no parental guidance. A nestmate of this bird remained near the nest site and was constantly attended by both parents. Eighteen days after fledgling, the nestmate was seen begging on the ground and subsequently following both parents in the air, still begging, as they flew directly toward the cherry orchard, one-third of a mile away. There is apparently no single explanation of how immatures find their way to feeding locations and fruit crops.

Feeding flocks will apparently remain intact for as long as there is an adequate fruit supply in a given area. In 1964, one flock of robins, about 75 birds, seemed to remain virtually unchanged from the end of June until the last week of August. The reason for this was that three successive fruit crops, tatarian honeysuckle, cultivated blueberries and wild, black cherries, all bordering the same small wood lot, provided a continuous supply of food for eight weeks. Certain conditions make some fruit crops more susceptible to heavy depredation by flocks of robins than others. Preferred feeding habitat for robins includes a brushy cover and a suitable loafing site nearby. Loafing areas, where birds spend the warmest parts of the day when they are not actively feeding, seem to be invariably in woods, broadleaf or evergreen, where there is an open floor. This enables the birds to browse in a shaded place for insects and to enjoy good visibility of potential predators.

Netting operations were carried on at two blueberry plantations at the University this year. One was bordered on two sides by bushes and by a wood lot with a loafing area on another. This plantation was an ideal center of activity for a large flock of robins. The other plantation was situated in the middle of the University apple orchard. The nearest cover, some woods, was about 150 yards away. This plantation was visited by robins, but only individual birds, rather than a flock. If this example is typical of robin behavior, a strong relationship between habitat and degree of depredation by robins certainly exists.

A large percent of the robins' food consists of fruit during the summer months. In this study they were seen to do heavy damage to cultivated cherries and blueberries. Also eaten by robins were wild tatarian honeysuckle, black raspberries, and black cherries. Peaches and wild and cultivated grapes were not touched by robins. Baltimore orioles, however, were observed doing considerable damage to both.

****

POMOLOGICAL PARAGRAPH

William J. Lord
Department of Plant and Soil Sciences

<u>Problems in growing apricots in Michigan</u> - Stanley Johnston and J. E. Moulton, Department of Horticulture, Michigan State University,

published Extension Folder F-318 in 1962 on "Problems in Growing Apricots in Michigan," and their observations seem pertinent since there is some interest in apricot growing in Massachusetts.

Winter injury and breaking of trees at the bud union are cited as being two problems that resulted in apricot tree loss. Young trees, especially those from 2 to 5 years of age, are apt to make excessive growth which matures late and, therefore, they are more subject to low temperature injury during November and early winter. Mature apricot trees are considered much hardier than mature peach trees and consequently winter injury is less of a problem on older than on young trees.

To reduce loss from winter injury, one of the suggestions is that young trees not be forced to make more than 2 feet of annual growth. Excessive growth also aggravates breakage at the bud union.

The publication can be obtained by writing to Michigan State University, East Lansing, Michigan.

****

HOUSEWIVES FOR APPLE PICKERS IN 1965

Ben Drew
Westford, Massachusetts

In common with most Massachusetts apple growers, I was faced with an apparent labor shortage for the 1965 apple harvest. In 1964, my crop had been harvested by 10 Canadians, 20 Florida migrants and an assortment of local help. In 1965, however, the chances of again using Canadian laborers appeared to be slight. To be eligible for the vague possibility of again obtaining Canadians, it would have been necessary to place all the available migrant and local help under the "criteria regulations," to pay a very substantial transportation cost for the Florida crew, and to endure other nuisance regulations of the "criteria."

In late July, I decided not to apply for Canadians. To fill the gap of an estimated 500 bushels per day of picking capability, I placed a large advertisement in the Lowell, Massachusetts, newspaper. This ad was aimed at the active housewife, who might have 4 hours during the day to devote to an outside activity, and who might be anxious to earn money as well as joining other women in an outdoor activity. I would like to stress that the ad did not attempt to glamorize the job, but stressed the realities of physical fitness. The ad asked them to come to the farm on a certain day - - and on that day, about 40 women of all ages and capabilities appeared. We took their names, carefully described the job of apple picking, and told them that a training session would be held in August.

By post card, about 20 women were asked to the training session -- and 16 came. They practiced setting ladders, using picking buckets and then they actually picked some Gravensteins. We discouraged 2 applicants during the training session, and screened out 2 others who were rough, and gave promise of being even rougher if hired.

We hired a retired couple to supervise these women, and although they hardly knew an apple from a peanut, they learned quickly and did a splendid job.

The women picked the smaller to medium-sized trees and were paid 25 cents per box. They were assisted by an experienced, older man who helped set the ladders and picked the hard-to reach branches.

From one season's experience with this unusual labor crew, I have drawn the following conclusions:

1. Housewives are a real potential source of harvest help.

2. Women can successfully pick from step ladders and from short straight ladders on trees which are not over 15 feet tall.

3. Women can pick apples carefully, but at the start they need extra help and supervision.

4. Women can earn enough at the standard piece work rates, to attract them to the job, but they should be told in advance that with good picking 5 to 7 boxes per hour is average for women.

5. It is necessary to allow flexibility in the hours of work to fit particular family problems.

6. By creating an atmosphere of consideration and courtesy, through competent supervision and suitable arrangements for their personal convenience, it is possible to add dignity and appeal to apple picking and will, I believe, bring help from a group which is not ordinarily a part of the usual labor force.

7. Although we did not attempt to glamorize the job of apple picking, I also must say that with a group of capable, responsible women, there still will occur most of the problems incurred with regular picking crews, with a few special ones for the ladies as well.

****

THE CAUSES AND SIGNIFICANCE OF DYING APPLE TREE BRANCH AND CROWNS

George N. Agrios
Department of Entomology and Plant Pathology

In almost every apple orchard, some trees have a few branches with sparse foliage and small leaves, or have branches on which the leaves suddenly turn yellow and die. A whole tree might show similar symptoms and may die, either quickly or after a relatively long period of decline. In many orchards the number of branches or trees showing these symptoms is not great and they are removed, as a matter of course, during the growing season or at the time of pruning. In an increasing number of orchards, however, more and more branches and trees of all ages are dying and their removal is not only time-consuming and costly, but also is reducing total yield appreciably.

Although a number of unfavorable conditions may result in branch or tree death, the most common cause is infection by fungi. The latter penetrate the bark through pruning wounds, bruises or other openings, and cause a collapse of tissues, resulting in girdling and death of the crown beyond the ring of collapsed tissues.

Several fungi have been found associated with dying apple branches and trees in Massachusetts. Cytospora is the fungus most commonly isolated from infected trees of most ages. It is argued, and there are good reasons to believe, that this fungus attacks branches already dead or about to die; but its widespead occurrence in our area on trees of various ages and degree of vigor seems to demand a closer examination of the preferences of this pathogen. Sphaeropsis is the next most commonly found fungus on apple and it not only kills branches but also causes fruit rot (black rot) and leaf spots (frogeye leaf spot). Other fungi isolated from apple cankers include Phomopsis (rough bark), Phoma (Brooks fruit spot), Cytosporella, Botryosphaeria, Gloeosporium (apple tree anthracnose), and Fusarium.

These fungi usually persist on infected apple branches and prunings, sometimes on infected fruits or leaves and, in a few cases, on other kinds of trees near the orchard. All of them produce spores on the infected tissues. In most cases the spores are contained within dark or amber-colored fruiting bodies which can be easily seen on the bark of affected tissues at certain times of the year. The fruiting bodies of the various fungi mature at different times during the growing season; thus, some of them release their spores in the spring, others in the summer or early fall, and some produce spores throughout the growing season. The spores are carried from branch to branch and from tree to tree by rain, wind, insects, birds, and by man and his tools.

Whether or not new infections will take place in an orchard depends on the presence of fungus spores in the area, the condition of the trees, temperature and moisture at the time the spores land on the trees. The presence of large cuts or wounds on branches seems to promote the onset of infections, and many infections begin at very small wounds made by the

pruning or breaking of small twigs or suckers. Large cuts, however, are important since they take longer to heal, and therefore, remain susceptible longer than small ones. Of even greater significance is the fact that the infection at these large cuts may even spread to remaining large branches and greatly reduce the bearing surface of the tree.

Most canker-causing fungi usually attack trees low in vigor. Quite frequently, however, very small cankers can be found around wounds on young, vigorous trees, but the spread of the fungus is prevented by a layer of callus tissue produced by the vigorous, healthy cells surrounding the fungus. In this situation, the fungus may starve after a few years -- unless the tree is suddenly weakened; then the fungus can overrun the plant defenses and cause a larger infection. It is also possible, although there is no direct experimental proof concerning these fungi, that the greater the number of infections occurring in an area, and the longer the time they remain unchecked on normally resistant, vigorous trees, the greater the chance for the appearance of new, more virulent races of the fungus. Such new races can then attack vigorously growing trees that would have been unaffected by the older, less virulent races of the fungus.

The presence of fungus cankers in well sprayed orchards indicates that the fungicides used for the control of apple scab, rust, powdery mildew and summer rots are either not effective against canker-causing fungi or that the timing of these sprays is wrong for the prevention of infection. Furthermore, the rapidity at which the fungi spread indicates that these fungicides have no effect on the canker once infection has taken place. This leaves growers defenseless against the apple canker fungi.

During the past year, growers found it necessary to remove an increased number of branches and trees killed by the canker fungi. Some growers estimate that this removal reduced the bearing surface in some blocks by 10 per cent -- causing a proportional 10 per cent reduction in yield.

Eradication of all cankers by pruning or surgery is an extremely difficult, and often an impossible task; therefore, usually enough cankers remain as a source of inoculum for renewed spreading of the disease.

The systemic fungicide required to prevent or control infection by the canker fungi has yet to be discovered. Until it is discovered, keeping apple trees vigorous, removing cankers as soon as they appear by frequent and proper pruning, and covering large wounds with a tree wax or paint seems to be the most effective means of avoiding losses from canker-causing fungi.

Much more information is needed about the fungi and their habits. A conscientious grower no longer fears apple scab, powdery mildew or rust fungi, because he knows how to control them. But, it took many years of work by scientists to obtain information about these diseases and to develop fungicides for their control. Information available on

the cause and control of fruit tree cankers is extremely sparse, however, and much is outdated. Yet, losses from cankers are increasing year after year and there is no end in sight.

Several misconceptions about cankers seem widespread among the growers. Many growers describe cankers as "fire blight", but we found no apple trees affected by this disease (which is caused by a bacterium) in any part of the state. Others attribute the cankers on their declining trees to viruses. Although this is much more difficult to disprove, this does not seem to be the case either. The most that virus infections can do, aside from their own peculiar symptoms, is to weaken and predispose trees to fungus infections. Cankers, however, are caused by fungi and are generally easily detected and identified. Finally, some growers blame the cankers on winter injury, drought, poor nutrition, and so forth. There is no doubt that these factors may result in tree injury, but it is the fungus infections on these trees that cause the greatest damage, since the progress of the infections continues long after the occurrence of the condition that helped the fungi become established.

****

FRUIT NOTES

Prepared by Pomology Staff, Department of Horticulture
Cooperative Extension Service, College of Agriculture
University of Massachusetts, Amherst

MAY – JUNE 1966

TABLE OF CONTENTS

Issued by the Cooperative Extension Service, A. A. Spielman, Dean and Director, in furtherance of the Acts of May 8 and June 30, 1914; University of Massachusetts, United States Department of Agriculture and County Extension Services cooperating.
Publication Approved by Alfred C. Holland, State Purchasing Agent, No. 44.

All pesticides mentioned in this publication are registered and cleared for the suggested uses in accordance with state and federal laws and regulations. Where trade names are used for identification no product endorsement is implied nor is discrimination intended.

WARNING: MOST PESTICIDES ARE POISONOUS. READ AND FOLLOW ALL DIRECTIONS AND SAFETY PRECAUTIONS ON LABELS, HANDLE CAREFULLY AND STORE IN ORIGINAL CONTAINERS WITH COMPLETE LABELS, OUT OF REACH OF CHILDREN, PETS AND LIVESTOCK.

HOW DO YOU MEASURE UP?

E. H. Wheeler
Department of Entomology and Plant Pathology

Young children are poisoned by pesticides more frequently than any other age group.

Improper storage of pesticides and unsafe disposal of "empty" containers are major causes. Youngsters are curious and they get from "here to there" before anyone knows it.

If your children, or anyone's children, can get to your pesticides or "empty" containers there is something wrong - something that is YOUR responsibility to correct.

Think over these suggestions - how do YOU measure up?

1. Store all pesticides (and other hazardous materials) in original, plainly labeled containers.

2. Have one place for pesticides - one which can be locked! (Another spot may be needed for products spoiled by freezing). A shed, garage or other open area is not a safe place to keep pesticides. Opened packages increase the danger.

3. A separate, well-marked building is best. Second best would be an enclosed corner or end of a structure in which no animals are housed - no people either.

4. Never leave pesticides outside the locked storage even though you may be planning to use them again tomorrow.

5. Pesticides and "empties" left unattended in the open at the mixing-filling station are an invitation to tragedy in this day when farms are not so isolated from non-farm families.

6. A ditch, stream bank or an open dump anywhere is NOT a safe place to throw "empty" pesticide containers.

7. Burn "empties", that will burn, in a spot where ashes can be buried; this amount of heat does not destroy some pesticides. And remember, smoke from organic phosphates is especially dangerous.

8. Bury bottles and metal containers 18 inches or deeper at a spot where, in so far as possible, you have determined there is no chance of later exposure or that waters can be polluted. It is best to break bottles and to puncture and/or crush cans and drums, but, do it in the hole or so that surface soil is not contaminated. Avoid splashing with the concentrate!

Remember! Accidents with pesticides don't just happen - somebody lets them happen - someone who didn't "measure up".

****

A NEW APPROACH WITH PICKING EQUIPMENT

Max G. Fultz
Regional Agricultural Specialist

Harried and worried as are apple growers with the harvest labor problem, it is logical and likely that they will turn to management means to help solve the problem. Solutions that can be contained within the industry have always been the favored and perhaps most effective answers to problems. The urgent need for mechanical substitutes or aids for human labor became increasingly apparent in 1965. Despite some research with mechanical picking contrivances, most leaders of the industry hold little hope that a mechanical picker will be available in time to get the industry past the present crisis. McIntosh, as well as other varieties, are too delicate and easily bruised for anything but perfection.

Emphasis on harvest aids to increase the efficiency of the picker, seems most practical. For many years, growers have constructed and tried apple picking aids of various types; stilts, mobile ladders, platforms, hydraulic lifts and so forth.

This photograph shows the attempt by Roger and Gordon Kimball to increase harvest efficiency by using a mechanical lift. The Kimballs' orchard property in Littleton, Lunenburg and Ashby, Massachusetts, is on rolling hills with most slopes gradual rather than excessively steep.

The machine used by the Kimballs enables one man to lift himself up and maneuver into position for picking, controlling the operation entirely from the bucket as shown. A small platform in front will hold filled boxes, another, back of the picker, holds 3 empties in the conventional 3 box "nest".

The Kimballs feel that a mechanical lift can be economical, but only if used as a part of a picking team, and for other jobs such as pruning and thinning. The machine operator expects to harvest the tops of the trees, leaving the fruit on the lower branches to be picked from the ground or from short ladders by the remainder of the team. They have used 25 per cent of the tree height as

a starting point, but plan to continue experimenting in 1966 to determine what portion of the top should be picked to make the team operation most economical. We should hope economists and other growers will help with calculations.

This approach is different from that of a movable platform that carries the entire crew, but has the same objective of making harvest more efficient and of taking some of the heavy work out of the operation.

We are presenting the information in this article as an example of a growers's attempt to increase harvest efficiency. It seems possible that some type of mechanical aid may prove helpful, but it must be economical and adapted to the trees and orchard terrain. In addition, costs can be distributed if the device can be used for other jobs. A device will be helpful if it can be used in conjunction with a crew harvesting from the ground or from short ladders. This could increase the number of available competent pickers. "Picking the Top" may well become an easy and desirable part of the operation.

****

IMPROVING APPLE HARVEST EFFICIENCIES WITH THE "THREE TEAM METHOD"

Dr. L. F. Whitney
Department of Agricultural Engineering

The on-coming apple harvest, again with prospects of a dwindling labor supply, requires some serious thoughts as to how to best use this labor. The "Three Team Method of Picking Apples"* may be a management technique which can be used toward this end. Devised in England, the system was evaluated at Michigan State University ten years ago. A 15% improvement in picking rates was demonstrated without a substantial increase in equipment investment. In 1965, one consultant in Oregon installed this system for an apple growing client with an avowed increase of 25%.

A ground based crew first picks all apples that can be reached from the ground in a conventional manner, then moves on to the next tree. Women and older pickers might constitute such a crew. Note that all apples below the 6' level would be removed before ladders and succeeding picker crews arrive, thereby eliminating the possibility for fruit to be knocked to the ground.

Picker "specialists" working on seven foot stepladders - or other equipment such as platforms - remove the fruit below the 12 foot height.

---

*"The Three Team Method of Picking Apples" by J. H. Levin and H. P. Gaston, Michigan State University, East Lansing, Michigan. Article 38-65.

Finally, other picker "specialists" working with conventional ladders follow to pick the remaining top level of the tree. Again, with the lower apples removed, less fruit are bruised or lost as drops.

The method is not without problems, since a piecework differential becomes necessary. Naturally, the ground based pickers can pick into conventional bags at the fastest rate, approximately 12 bu/hr; on 7 ft. stepladders, 7½ to 9 bu/hr; from 18 ft. ladders, 4½ - 5 bu/hr.

Two methods have been suggested to overcome this difficulty. The best method: a "team" divides the day's efforts equally. This is a lot easier said than done, but one grower in California asserts that his supervision problems are considerably reduced because one worker will prod another - to the mutual benefit of all. The foreman's responsibility is largely limited to bruise control and associated problems. The second method employs a combination of minimum wage and bonus - all of which involves more paper work and supervision. As an example, a minimum wage of say $1.60 might be set with a "plus or minus" bonus system. The ground based workers would receive 15¢/bu. over a minimum 10/bu/hr. requirement; the "mid section" pickers, 20¢/bu. over 7 bu/hr.; and the "top pickers". 25¢/bu. over 5 bu/hr. Individual rates and payment schedules would need to be worked out to suit one's own experience with pickers.

While this method had not received much acceptance 10 years ago when first introduced to this country, times have changed insofar as the availability of labor is concerned. More recent acceptance is in evidence in many fruit growing locations. Perhaps there may be something here worthy of consideration for New England's growers.

A limited number of bulletins which describe this method in more detail have been secured and can be obtained at no cost by writing to the Agricultural Engineering Department, University of Massachusetts, Amherst, Massachusetts.

****

DICHLOBENIL NOW LABELLED FOR FRUIT TREES

William J. Lord
Department of Plant and Soil Sciences

Dichlobenil (commercial product Casoron) has label clearance for use in bearing and non-bearing apple, peach, pear and prune-plum orchards. This material is available in wettable powder and granular form.

Like simazine and diuron, dichlobenil destroys germinating seeds of annual weeds. This means that to be most effective in our sod-mulch orchards, dichlobenil would have to be used with a contact herbicide. In 2 tests at the University orchards, however, mixtures of dichlobenil and contact herbicides gave good initial grass and broadleaf weed control, but did not control grasses (the principal weed problem) as the season

advanced. This indicates that the soil residue of dichlobenil was not sufficient to give season-long control of grass and broadleaf weeds in the first year of use. Repeated annual application would perhaps provide better control than we have obtained. Growers who would like to try dichlobenil might use this material in orchards where weed control programs have already been initiated. In these orchards, the grass and broadleaf weed cover has already been partly eliminated and weakened, and dichlobenil might be more effective.

Late fall and early winter applications (Nov. 1 to Dec. 15) of granular dichlobenil are suggested for control of quackgrass in orchards. Therefore, Regional Specialist Dominic A. Marini and the writer have initiated 3 trials to test the effectiveness of early-November and mid-November applications of dichlobenil for grass and broadleaf weed control. The results of these trials should be available prior to the fall of 1966.

****

POISON IVY CONTROL TRIALS

William J. Lord and G. Everett Wilder
Department of Plant and Soil Sciences
&
Regional Agricultural Specialist

A study, recently completed, was conducted to test the effectiveness of 3 herbicide formulations containing amitrole when applied near full bloom for 3 consecutive years, 1963 through 1965, under McIntosh apple trees for the control of poison ivy.

The results obtained indicate that unsatisfactory poison ivy control is obtained under apple trees from 1 application of an amitrole-containing herbicide applied near full bloom. However, satisfactory control can be obtained with repeat applications of this material, although it appears that complete eradication of poison ivy by applications near bloom of apple trees requires more than 3 consecutive yearly applications. Without complete eradication, failure to spray on an annual basis would result in a rapid re-infestation of this weed.

The label for a herbicide containing amitrole has recently been changed, and it now defines "prior to fruit set" as being before 90% petal fall. This permits applications that may be several days later than the treatments applied in these tests. Since poison ivy leaf expansion is generally rapid in mid-May, yearly applications of amitrole-containing herbicides used just prior to 90% petal fall may result in better control than those obtained in this study.

****

RECENT PUBLICATIONS

You may wish to send for one or more of the following publications:

1. An economic study of apple production on size-controlled trees. A.E. Res. 186. Available from Agricultural Experiment Station, Cornell University, Ithaca, New York.

2. Maine blueberry recipes. Bulletin 516. Available from Cooperative Extension Service, University of Maine, Orono, Maine.

****

A GLIMPSE AT THE MICHIGAN FRUIT INDUSTRY

William J. Lord
Department of Plant and Soil Sciences

For the fifth consecutive year, I have had the opportunity to make a brief tour through a "foreign" fruit-growing district. This year, I viewed the Michigan fruit industry, and herein is a report of my observations.

Young Plantings

Though it is not possible to thoroughly and accurately analyze an industry following a brief inspection, several observations stood out clearly. One of these is that a considerable increase in production of apples will soon occur in Michigan. Recent plantings have been heavy, and great numbers of young trees are to be seen. These trees are planted on some fine orchard sites. Only the ominous labor shortage dampens the enthusiasm of the industry.

Dwarf apple trees are prevelant in these younger plantings, mostly on EM VII rootstock. McIntosh performance on this rootstock is satisfactory, but as in Massachusetts, the rootstock produces suckers and the trees tend to lean. Tree spacing of 16' by 26' is apparently suitable for this variety on EM VII.

Clean cultivation of the orchard for the first 2 or 3 years after planting is considered a good practice in Michigan. In the older non-bearing orchards, a strip in the tree row is generally kept free of grass and broadleaf weeds with herbicides, and the remainder of the orchard floor is in sod. Broadleaf weeds that are resistant to the herbicides have invaded these intra-row strips, but a recently labelled herbicide and another which hopefully will be labelled in the near future should help control these weeds.

Mold-and-Hold Pruning

"Mold-and-hold pruning" is a relatively new phrase to the Massachusetts fruit industry. I obtained the following concept of this pruning system. Do little or no pruning and fertilize heavily the first 5 to 8 years to obtain a large bearing surface. Trees of some varieties may be scored with a knife to induce flower bud initiation after the fourth or fifth year. When the trees are bearing fairly heavily and are of the desired size, reduce the rate of fertilization and hold the tree size by pruning. Tree size can be restricted by heading back or complete removal of side limbs that crowd or get too long. When heading back a limb, make the cut outside a younger shoot nearer the center of the tree. To prevent the trees from getting taller, cut back any limbs or remove watersprouts which grow beyond the predetermined maximum height. Considerable detailed pruning also is involved, because in addition to the corrective cuts, all new growth is headed back. Since detailed pruning stimulates growth, nitrogen fertilization must be adjusted to tree needs.

Hilltop Orchards

At Hilltop Orchards in Hartford, Michigan, we observed the performance of several apple varieties on various rootstock with varied planting distances. Of particular interest, was a planting of Jonathan, Red Delicious, and Golden Delicious on Malling VII rootstock. These trees, which were spaced 16' by 24', averaged 9 years of age and by our standards had received little or no pruning. In 1965, the per acre yield of these Jonathan, Red Delicious and Golden Delicious trees was 951 bushels, 602 bushels and 937 bushels, respectively. The present size of these trees will be maintained by the mold-and-hold system of pruning. To me, the trees appeared to be too thick, but this situation could be easily corrected by gradual removal of some surplus scaffold limbs.

One block of trees at Hilltop Orchards was planted in a double hedgerow--interplants set to one side and between the trees in the row. The double hedgerow is made possible by use of herbicides between and under the trees. This planting system, along with mold-and-hold pruning, may permit keeping the interplanted trees permanently. Whether or not the double hedgerow is more satisfactory than closer spacing in the row and between rows as a method of increasing tree numbers per acre, is not known. Personally, I favor a single hedgerow system. However, this is an opinion!

Wallace Heuster, Manager of Nursery Production and Sales at Hilltop Orchards, took us to the orchard of Everett Wiles, also in Hartford. There we observed a block of mature Jonathan on standard rootstocks being maintained at a 20' by 24' planting distance. The growth was being restricted by removal of all upward growing wood and by the cutting back of scaffold branches. The tree spread appeared equal from top to bottom, but most unusual was the removal of the vigorous wood and the leaving of the drooping wood. We were told that yields of 1500 bushels per acre were being harvested from this block. To me, this is further proof that close plantings of trees on standard rootstocks can be maintained by pruning to restrict tree size and to favor fruit color.

Tree Walls

At present, attempts to increase efficiency of apple harvest through increased mechanization have not been encouraging, and many persons believe that orchard modification holds more promise. If tree height is lowered and the trees are trained to a solid hedgerow of restricted width, harvest efficiency can be increased. It was of interest to observe the tree walls being developed by Dave Friday, in Hartford, Michigan. These were described by Friday in the December, 1965, issue of the American Fruit Grower.

Standard Red Delicious and Golden Delicious on seedling roots were planted 12' by 18' by Friday in 1958. The trees were heavily fertilized and they made about 36 inches of terminal growth per year for the first 3 years. The trees were not pruned for 3 years, and in the fourth year the central leader was removed. Two weeks after petal fall, in the third year, the Red Delicious were scored with a linoleum knife and these trees had a snowball bloom the following spring. The Red Delicious again were scored the following 2 years. It was not necessary to score the Golden Delicious. The orchard produced 500 bushels per acre in the fourth year, 800 bushels the fifth year, and 1000 bushels per acre the sixth year.

Friday plans to hold the trees to their present size by cutting off any limb that gets too long and letting another grow to take its place. He stated that maximum tree height should be 14 feet and that the rows should run north and south to permit maximum exposure to the sun on both sides of the rows.

Friday's newer plantings are spur types on seedling roots. Because of the upright growth of these trees, he is experimenting with chemicals and bending techniques to restrict vegetative growth, encourage early fruiting, and to develop a tree wall. One system being tried is the tying together of branches of adjacent trees. Upward growing branches are bent downward and scaffold branches extending into the middle of the rows are pulled into the tree row.

The most practical bending technique to restrict growth and encourage early fruiting is not known. Techniques that involve tying limbs to wire trellises, to clips forced into the ground, or merely tying together the branches of adjacent trees may develop. Techniques developed probably will vary with variety and growing area.

Conclusion

The Michigan fruit industry is a rapidly expanding one, and the growers are experimenting with many practices that we might consider radical. However, from these experiences, we may find solutions to some of our problems. The developments in the Michigan industry will be interesting and important to note for many years to come.

****

FRUIT NOTES

Prepared by Pomology Staff, Department of Horticulture
Cooperative Extension Service, College of Agriculture
University of Massachusetts, Amherst

JULY–AUGUST 1966

TABLE OF CONTENTS

Issued by the Cooperative Extension Service, A. A. Spielman, Dean and Director, in furtherance of the Acts of May 8 and June 30, 1914; University of Massachusetts, United States Department of Agriculture and County Extension Services cooperating. Publication Approved by Alfred C. Holland, State Purchasing Agent, No. 44.

MAILING LIST REVISION

In accordance with penalty mailing regulations, the mailing list for _Fruit Notes_ is being revised. Indicate on the form below whether or not you wish to continue to receive _Fruit Notes_, and mail to William J. Lord, Department of Plant and Soil Sciences, French Hall, University of Massachusetts, Amherst, Massachusetts 01003.

/_/ YES...Leave my name on your mailing list.

/_/ NO....Remove my name from your mailing list.

Name____

Address____

______________________________Zip Code_________

APPARENT BORON TOXICITY

William J. Lord, Dept. of Plant and Soil Science
and
Bertram Gersten, Feed and Fertilizer Control Service

An excess of boron may have a deleterious effect on fruit trees; therefore, growers are cautioned against over-application of this element. Since boron toxicity is not common, pictured here are leaves from 1-year-old McIntosh trees which show typical symptoms of boron toxicity. Leaf injury from an over-application of boron is distinctive in that a loss of green color occurs along the midrib and larger lateral veins, being first apparent at the base of the leaf blade. In severe cases, loss of chlorophyll is more extensive than shown in the picture, marginal leaf scorch develops, and the leaves drop.

Samples of "normal" appearing leaves were obtained from a Massachusetts orchard on July 30, 1965, from: A) 5 trees showing slight foliar injury; B) 2 trees with very slight foliar injury; C) 4 trees showing no apparent injury, but from the rows where the injury occurred; and D) 4 trees in a row adjacent to the rows with affected trees. Trees most severely injured could not be sampled because of defoliation and/or because leaves without the symptoms could not be obtained. The average boron level of the trees in group A was 97 ppm, in group B, 83 ppm, in group C, 70 ppm and in group D, 50 ppm.

Since foliar symptoms of boron toxicity are distinctive and the limited data indicate an abnormally high boron level (30-50 ppm appears to be common boron levels of apple trees), we feel sure that an over-application of boron had occurred.

****

HEAT TREATMENTS TO REDUCE POST-HARVEST DECAY OF FRUITS

William J. Bramlage
Department of Plant and Soil Sciences

It has long been known that exposure of fruits to a brief period of high temperature can reduce decay from certain organisms. Until the recent controversies over chemical residues focused attention on non-chemical disease-control measures, little practical consideration was given this knowledge. But during the past few years, the U.S. Department of Agriculture has been conducting numerous tests with heat treatments, and some of these tests have been quite successful.

Peaches respond very well to heat treatments. In an early report by W.L. Smith, et al. (U.S.D.A. Mktg. Res. Rept. No. 643), it was shown that the organisms Monilinia fructicola and Rhizopus stolonifer, which cause most of the post-harvest rot of peaches, are very susceptible to heat inactivation. Most of the ungerminated spores on the fruit surface, as well as the vegetative growth of established infections under the skin of the fruit, were killed by a 3-minute dip in 130° F water, and subsequent decay was greatly reduced and market life extended. However, the 3-minute dip sometimes injured the peaches, causing a tan mottling on the skin, and although this injury was not severe, it was objectionable. This report emphasized that a heat treatment must be followed by rapid cooling of the fruit or storage life would be reduced and hydrocooling was recommended.

A recent report by Smith (Proc. Va. State Hort. Soc. 54:95-97) now recommends the use of a 2½ minute dip in water at 125-128° F. This exposure avoids the injury to the fruit and still produces substantial reductions of decay. The time and temperature of the dip are critical; too short an exposure or too low a temperature does not provide disease control, and too long an exposure or too high a temperature results in injury. Bulk dips of the fruit are practical and effective, and the treatment can readily be applied along the packing line. A hot water dip should be followed by hydrocooling, and it is essential that the hydrocooling be done sanitarily, that is, the water must contain sufficient chlorine to prevent re-inoculation with fungal spores.

Hot water treatments have been used commercially for 3 years in the Southeast on peaches. Some early results were discouraging, but the problem proved to be unsanitary hydrocooling, not the hot water treatment itself. With careful control of time and temperature of dip and of sanitation, decay of peaches is usually markedly reduced by the heat treatment.

Another experimental approach to heat treatments involves the use of hot air instead of hot water. Holding strawberries at 110° F at 98% relative humidity for 30 minutes has greatly reduced decay. Such a treatment might prove commercially feasible, but this has yet to be established.

In England, tests are now being made on heat treatments with apples. This is being done primarily to control gloeosporium rots, but heat treatments can also reduce scald. Hot water dips (113° F, for 6 minutes) were found to be effective in controlling rots, but since they involved some serious handling problems, hot air treatments are now being tested.

Heat treatments have been tested on numerous commodities, frequently with success. Adaptation of laboratory tests to field conditions are few, however. Nevertheless, the use of heat treatments for post-harvest disease control may hold much promise for the future.

****

A USEFUL TOY

G. David Blanpied
Department of Pomology - Cornell University

During one of the discussion periods at the 1964 CA Seminar, one of the growers expressed interest in a toy listening device for detecting leaks in CA rooms. This toy, which is a sound-magnifying device available from a well-known mail order house, is advertised as a spying device for listening to distant conversations. We purchased one of these toys and found that it was of some value in detecting leaks in CA rooms. One cannot use the device to locate leaks at great distances. It cannot be used to detect leaks which cannot be heard by unaided ear, but it is useful for quick scanning of joints, pipe and conduit exits, door seals, etc. It simply speeds up the location of leaks which normally require the listener to pass his caulky ear 2 inches from every nail hole in the room. It's easier to pass your hand than your ear over all those possible sources of leaks. The listening device allows you to put your ear in your hand.

****

CA STORAGE IN MICHIGAN

William J. Lord
Department of Plant and Soil Sciences

While visiting the apple industry in Michigan last March, the following notes on CA storage were made and may be of interest to others.

Contrary to CA storages in New England, galvanized sheets commonly were used to obtain a gas seal and the majority of rooms seen were water scrubbed. Lime was being used to supplement water scrubbing, however. Since most CA rooms in Michigan are water scrubbed, a smaller percentage

of the rooms will be converted to dry lime scrubbing than in New England where caustic soda scrubbers are most common.

At the Barden Orchards in South Haven, we saw a CA storage with "pole-barn" type of construction. According to Dr. Don Dewey, Michigan State University, the walls and ceilings of the rooms are insulated with 4 inches of Styrofoam, but the floors have no insulation. The insulation is protected on the exterior wall by corrugated metal but is left exposed on the interior side. The refrigeration in these rooms also is unique in that the Bardens' utilized Krammer straddle units, which are unitized completely and installed by hanging over the wall at the time of erecting the storage.

Storage operators in Michigan pay a $25 fee to the Michigan Department of Agriculture for each CA room. The minimum storage period, with not more than 5% oxygen, for certification as CA apples is 90 days for all varieties, with the exception of the Jonathan, which has a 60 day minimum storage period.

Representatives of the Food and Standards Division of the Department of Agriculture affix a seal to the door of each CA room at closing. Whenever an interruption in the storage period occurs, this Department must be notified within 48 hours after opening the room. Upon investigation, the room may be resealed by an authorized representative of the Food and Standards Division of the Department of Agriculture. However, the rules and regulations governing CA storage state - - "The oxygen level in any sealed controlled storage may exceed five (5) per cent for an accumulated time, not to exceed ten (10) days (240 hours) during the storage period. The storage period shall be increased to 100 days for all fruit except Jonathans, which is seventy (70) days when the atmospheric conditions have been interrupted."

****

POMOLOGICAL PARAGRAPH

William J. Lord
Department of Plant and Soil Sciences

<u>Russet of Golden Delicious</u> - During a visit with Dr. Arthur E. Mitchell, Michigan State University, he stated that Golden Delicious are most susceptible to pesticide injury and subsequent russeting from pre-pink to 5 weeks after bloom and that this variety is most susceptible at petal fall. To reduce russet, he suggested a captan or thylate fungicide program from pink to 5 weeks after bloom and to delay the use of insecticides until first cover. And, at that time, Guthion should be the only insecticide used.

(Editor's Note: In the Northeast, where the plum curculio is a severe problem, this program would not be advisable for two reasons; (1) under our conditions, a Calyx (petal fall) spray is needed for curculio and (2) Guthion is not as effective as dieldrin under curculio conditions encountered in some of our orchards.)

****

CARBON DIOXIDE UPTAKE OF STORED LIME

William J. Lord, Dept. of Plant and Soil Sciences
and
Bertram Gersten, Feed and Fertilizer Control Service

Is lime that has been stored of value for carbon dioxide (CO_2) removal from CA storages? In an effort to find an answer to this question, lime samples from bags obtained in the fall of 1964, but not used in a lime scrubber during the 1964-1965 storage season, were analyzed in September, 1965.

Even though the CO_2 content of air is very slight (0.025%), it is apparent in Table 1 that considerable uptake of CO_2 occurred over a 1-year period. Also, as one would suspect, the CO_2 content of the outer portions of lime in the bag was greater than that of a composite lime sample from the entire contents of the bag.

Table 1. Carbon dioxide content of lime in September, 1964, and after approximately 1 year storage in packing shed.

Lime[1]	Carbon dioxide content of lime		
	Composite sample Sept. 1964	Composite sample Sept. 1965	Sample of periphery of bag contents Sept. 1965
	%	%	%
A	1.4	9.7	20.3
A	1.4	7.9	21.5
A	1.4	5.9	25.4
B	1.6	7.0	20.4
B	1.6	3.8	9.2
C	6.2	8.0	20.0
D	2.1	8.0	12.6

[1]There were 3 bags of Lime A, 2 of Lime B, and 1 each of Limes C and D.

The limes, however, were far from being saturated with CO_2. Analyses performed on lime from the same lots, but placed in scrubbers during the 1964-65 storage season, showed that after 1 month of use in a dry lime scrubber, a composite sample from 1 bag each of limes B, C and D had CO_2 equivalents of 10.5%, 16.9% and 22.9%, respectively. At the end of storage, these limes had CO_2 equivalents of 23.0%, 21.4% and 37.5%, respectively. Bags of lime from the same lot as lime A had CO_2 equivalents of 25-30% at the end of the storage period. Consequently, even though considerable CO_2 was absorbed during a year's storage of these limes, they would still have been of value for scrubbing.

Further Tests Conducted in 1965-1966

To further test the value of other than "fresh" lime for scrubbing, the carbon dioxide contents of 3 types of lime in a dry-lime scrubber were compared to those of similar types of lime stored outside the scrubber during the 1965-66 storage season. The limes inside and outside the scrubber were sampled at monthly intervals from November through March.

For simplicity, only the data obtained from the analyses of a high-calcium hydrated lime are presented in Table 2, but data obtained for the other 2 types of lime (a hydrated dolomitic lime and a dolomitic spray lime) were similar.

Table 2. Carbon dioxide absorption of lime in a dry-lime scrubber in comparison to similar lime stored outside of the scrubber

	Carbon dioxide content of lime[1]			
	In scrubber		Outside scrubber	
Sampling date	Composite sample[2]	Top of bag	Composite sample[2]	Top of bag
	%	%	%	%
10/18/65	2.3	4.9	---	---
11/18/65	9.3	33.0	2.4	2.4
12/15/65	15.1	35.1	2.0	13.7
1/18/66	19.3	33.0	4.7	17.3
2/16/66	27.8	35.4	3.9	16.5
3/16/66	34.6	35.4	3.1	15.7

[1]High-calcium hydrated lime - (CaO, 72-74%; MgO, 0.2-0.6%). Bags placed vertically inside and outside of scrubber.

[2]Lime sample obtained with a sampling tube thrust diagonally 3 times from top to bottom of bag.

It is apparent from Table 2 that in the bags stored outside the scrubber, no appreciable change in CO_2 content occurred other than surface absorption by the lime. These data substantiate the data presented in Table 1 and indicate that other than fresh lime would be of some value for CO_2 removal.

However, if such lime were used, it might be necessary to change the lime before the end of the storage season. Therefore, the labor involved in changing the lime, if this becomes necessary, compared to the cost of fresh lime, should be considered when deciding whether or not to use "old" lime.

Another point worth noting about the data in Table 2 is the pattern of absorption of CO_2 by the lime in the scrubber. By November, the lime at the surface (on the top) of the bag was essentially saturated with CO_2. The composite sample showed, however, that the inner contents of the bag were not nearly saturated. But, the CO_2 content of the inner contents rose at a steady rate throughout the storage season, until in March the inner and outer samples had almost identical CO_2 contents. It would appear, then, that at least in our experimental lime scrubber penetration of the atmosphere through the entire contents of intact bags of lime was readily occurring, and full utilization was being made of the lime in the bag.

****

RESEARCH FROM OTHER AREAS

William J. Lord
Department of Plant and Soil Sciences

Pollination Studies on the Highbush Blueberry - Due to concern among highbush blueberry growers in Michigan about inadequate pollination, Joseph Dorr and E.C. Martin, Department of Entomology, Michigan State University, East Lansing, Michigan, investigated this problem and the results of their studies are reported in the quarterly Bulletin of the Michigan Agricultural Experiment Station, Volume 48, No. 3, February, 1966. Their studies indicate that:

1. The bee population working many Michigan highbush blueberry plantings is inadequate for optimum pollination. Lack of adequate pollination reduced yield and fruit size, and delayed maturation of the berries.

2. Honeybees are capable of pollinating highbush blueberries.

3. Honeybees appear to have varietal preferences. They were observed to fly over Earliblue to work other varieties and did not work Coville well.

4. The honeybees were most numerous on the bushes close to the hives. Therefore, it was suggested that an even distribution of beehives throughout the planting should result in the most complete pollination.

5. Bumblebees are efficient pollinators of highbush blueberries and efforts should be made to maintain or increase their numbers in areas where this fruit crop is grown.

****

All pesticides mentioned in this publication are registered and cleared for the suggested uses in accordance with state and federal laws and regulations. Where trade names are used for identification, no product endorsement is implied nor is discrimination intended.

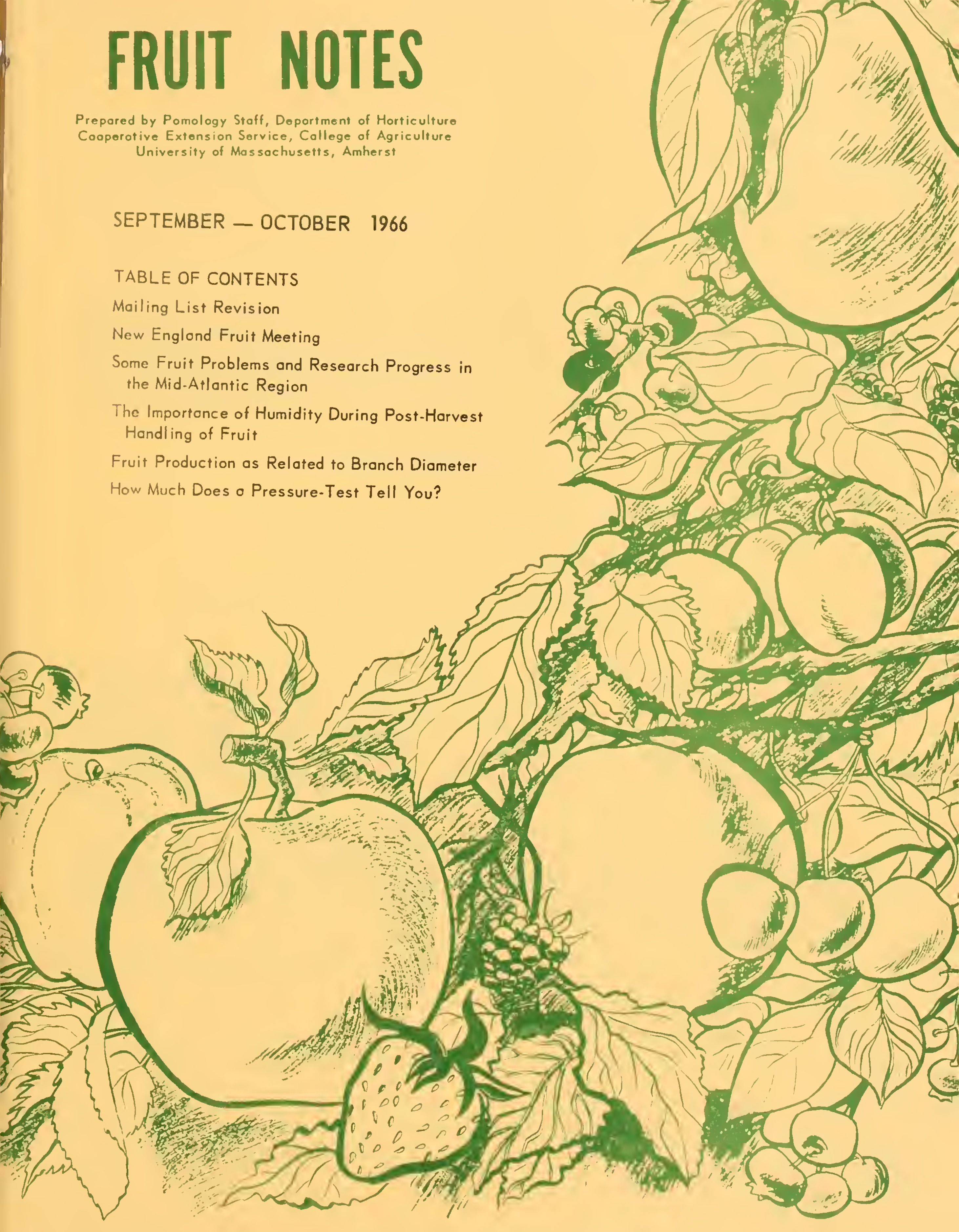
WARNING: MOST PESTICIDES ARE POISONOUS. READ AND FOLLOW ALL DIRECTIONS AND SAFETY PRECAUTIONS ON LABELS, HANDLE CAREFULLY AND STORE IN ORIGINAL CONTAINERS WITH COMPLETE LABELS, OUT OF REACH OF CHILDREN, PETS AND LIVESTOCK.

FRUIT NOTES

Prepared by Pomology Staff, Department of Horticulture
Cooperative Extension Service, College of Agriculture
University of Massachusetts, Amherst

SEPTEMBER — OCTOBER 1966

TABLE OF CONTENTS



Issued by the Cooperative Extension Service, A. A. Spielman, Dean and Director, in furtherance of the Acts of May 8 and June 30, 1914; University of Massachusetts, United States Department of Agriculture and County Extension Services cooperating.
Publication Approved by Alfred C. Holland, State Purchasing Agent, No. 44.

MAILING LIST REVISION

If you did not return the mailing list revision form in the July - August, 1966, Fruit Notes, you will find another form below. This form must be returned if you wish to receive future issues of Fruit Notes. Mail the mailing list revision form to William J. Lord, Department of Plant and Soil Sciences, French Hall, University of Massachusetts, Amherst, Massachusetts 01003.

/_/ YES...Leave my name on your mailing list.

Name____

Address_____________________________________

_____________________________________Zip Code_____

All pesticides mentioned in this publication are registered and cleared for the suggested uses in accordance with state and federal laws and regulations. Where trade names are used for identification, no product endorsement is implied nor is discrimination intended.

WARNING: MOST PESTICIDES ARE POISONOUS. READ AND FOLLOW ALL DIRECTIONS AND SAFETY PRECAUTIONS ON LABELS, HANDLE CAREFULLY AND STORE IN ORIGINAL CONTAINERS WITH COMPLETE LABELS, OUT OF REACH OF CHILDREN, PETS AND LIVESTOCK.

NEW ENGLAND FRUIT MEETING

For financial reasons, the 1967 New England Fruit Meeting and Trade Show will be held at the New Hampshire Highway Hotel, Concord, New Hampshire, instead of Suffolk Downs, Boston. The meeting is scheduled for January 5 and 6, 1967.

Travel time from Amherst to Concord, New Hampshire, is the same as from Amherst to Suffolk Downs.

The hotel is accessible to all major highways. Routes 3 and 93, which lead to Concord, are accessible from anywhere in Massachusetts. Persons coming from western Massachusetts and southern Vermont, may find Routes 9 or 10 to Keene, New Hampshire, and then Routes 9, 202, 89 and 93 to the Highway Hotel most convenient.

****

SOME FRUIT PROBLEMS AND RESEARCH PROGRESS IN THE MID-ATLANTIC REGION[1]

A. H. Thompson
Department of Horticulture, University of Maryland

Perhaps the most serious fundamental problem to be found in the Appalachian fruit growing area, is that of lack of adequate soil water. Thousands of acres of orchards are growing in this region on thin shale soils which have never had an adequate reservoir of soil water to sustain profitable fruit production under conditions as we know them today. The problem has become acute in this, the fifth consecutive year of drought. Not only has precipitation in these past 5 seasons been inadequate to size the crop, but it is also clear that the cumulative effects of drought are markedly shortening the economic life of our orchards. The statement is now being repeated in fruit circles of the area, that planting on thin shale land can mean as much as 10 years off the productive life of an orchard. It is clear that future orchards must be grown on soils deep enough to hold an adequate reservoir of water, or in cases where orchards are planted on shale land, that sufficient irrigation water be avilable to use annually.

Annual applications of nitrogen to both apples and peaches in Mid-Atlantic orchards have pretty well taken care of the need for this element. Among other elements, magnesium and boron are on a stand-by basis

---

[1]This article is a summation of the talk presented at the Annual Summer Meeting of the Massachusetts Fruit Growers' Association, Horticultural Research Center, Belchertown.

in the minds of fruit growers and researchers alike, to be used when and where needed. Calcium as a plant nutrient is being given more and more attention in this region. Calcium has long been cited as the needed treatment in Delicious orchards to correct internal bark necrosis, commonly known as apple "measles." However, surface applications of calcium have largely failed to correct this disorder, and perhaps the failure is due, in a large measure, to failure to get the calcium down in the rooting zone of the trees. For this and other reasons, growers are now encouraged to plow down calcium in the entire orchard area before planting a new block of trees. The precise nature of internal bark necrosis and its correction remains a debatable matter in Appalachia.

The Maryland Experiment Station has closed out 15 years work on chemical thinning of apples and turned the matter over to growers. No single compound has proven to be the best for all varieties. On Golden Delicious, the most commonly sprayed variety, we find that the combination of Naphthaleneacetic acid and Tween 20 is the most reliable and effective from year to year, and we have growers in Maryland now with as much as 10 consecutive years of experience with this combination. Sevin, the new insecticide, is the only compound recommended for Rome Beauty and Red Delicious in Maryland, while Amid-thin is the preferred compound on most other varieties, including York Imperial. Recent research has shown that Sevin will thin the York variety just as well as Amid-thin, but Sevin-sprayed Yorks will not "come back" with an off-year crop. No satisfactory thinning compound has yet been developed for spray thinning of the peach.

New plantings of apples in the Mid-Atlantic region indicate that the York Imperial variety is going to remain the dominant variety in this region for some time to come. In the Spring of 1966, area nurseries were sold out of trees of this variety, a situation which provides unmistakable evidence of what is going to be around 20 years from now. Rome Beauty is still being fairly extensively planted in this region, whereas Stayman and Jonathan have been declining for some time. Like other apple-producing regions of the nation, the Mid-Atlantic section has been planting thousands of Red Delicious trees. Among the new non-spur red sports of Delicious, Ryan Red, Topred, Red Prince, Red Queen, and Hi-Early have proved in area tests to be outstanding strains, whether grown under good coloring conditions in the mountains or under the poorer coloring conditions on the coastal plain. The 3 best known of the spur types, namely Starkrimson, Redspur, and Wellspur, leave much to be desired as far as fruit characters are concerned. The fruits are higher in chlorophyll than are non-spur type fruits, and quality of the spur-type fruit remains inferior until the Christmas holiday period or somewhat later. Through the middle to the latter part of the apple storage season, however, spur-type fruits have been very acceptable in Maryland tests. The vegetative characteristics of the spur-type tree are very exciting, however, and make the choice between a spur and a non-spur type very difficult indeed when planting a new orchard. Golden Delicious has been very heavily planted in the Mid-Atlantic region and the current emphasis is on finding a russet-free Golden. Several interesting entries in this race are at hand, including Sungold from New Jersey, the Milburn Gold in Maryland, and the Kelly Golden from Kentucky. Of this group, however, only the Milburn Golden is a true Golden Delicious, whereas the other 2

are seedlings. From experience thus far gained in this matter, it is clear that Golden Delicious trees do vary in susceptibility to russet, and that russet-free selections can be made and propagated to advantage. More will be heard of this in the future.

The modern debate over the close planting of dwarf trees in the new apple orchard has raged in Appalachia as it has elsewhere, and the truth has yet to be learned. The extent to which dwarf plantings have been made in the Mid-Atlantic region has to this point been modest, but people are interested and plantings are being made. Plantings seen by the writer on EM IX have generally been failures under Mid-Atlantic conditions. More interest, however, was centered around EM VII in the beginning, an interest that now has given way to MM 106, a similarly-sized stock that presumably provides better anchorage and produces fewer suckers. Such non-vigorous rootstocks have proved disastrous, however, when combined with such varieties as the York Imperial, and this has led to current interest in more vigorous stocks such as MM 111. Coupled with this interest in more vigor is a fascination with close-planting of spur types on either seedlings or vigorous clonal stocks with the idea of "mold and hold" pruning and training to keep the trees in bounds. Stories of fantastic tonnage coming out of the West on close planting have stimulated interest in this sort of thing, and a few growers have succumbed to the press releases and have close plantings in the ground. Many undoubtedly lead only to disaster because they are planted on thin soils that cannot deliver the water to sustain the plantings in a normal year. Others will come to the same end because of failure of management. It should be pointed out that neither growers nor researchers have yet learned how to "mold and hold" in Appalachia. We have seen it in this nation and in Europe, but until it is done successfully here, such a practice must be viewed as experimental.

Fruit production in Appalachia today is in a state of rapid transition. The critical labor situation dictates the trial of practices that were unheard of just 5 years ago, and the intense exploration of ways and means to facilitate the biggest job of all, that of harvest. Growers themselves are doing as much experimenting as researchers in new planting distances in stock and scion combinations, in an effort to arrive at long-term answers. There will be many failures, but there will be successes too. In the view of the writer, successes of the future will result from the combination of the provision of adequate soil water, and the application of superior management.

****

THE IMPORTANCE OF HUMIDITY DURING POST-HARVEST HANDLING OF FRUIT

William J. Bramlage
Department of Plant and Soil Sciences

While the importance of temperature during handling and storage is usually well recognized, the importance of humidity is often overlooked.

This oversight can lead to serious consequences in either of 2 ways: if humidity is too high, decay is accelerated; and if humidity is too low, weight loss is accelerated. As we are now entering into the storage season, a review of these problems seems appropriate.

Fungal spores are always present on the surface of fruits. For the spores to germinate and the fungi to attack the fruit, moisture is needed. If the humidity around the fruit is at or near 100% relative humidity (RH), spores will rapidly germinate, and if free moisture is on the fruit, germination is even more intense. Once spores are germinated, high humidity must continue as the young fungi develop, for if they dry out they will die. However, growth is very rapid, and high humidity is necessary only for a period of hours before infections become established and unaffected by humidity changes. To reduce the disease problem, storage recommendations usually call for 90-95% RH, never 100%.

However, at anything less than 100% RH, moisture loss occurs and the fruits consequently lose weight and may shrivel. To understand and appreciate the seriousness of the moisture-loss problem, we must understand the concept of "vapor pressure." Relative humidity tells us the percent of saturation with water vapor of the atmosphere <u>at a given temperature.</u> But as temperature changes, the saturation value changes, and therefore RH changes, for it is a relative rather than absolute value. Vapor pressure (VP), on the other hand, is an absolute measure of the moisture in the atmosphere. Vapor pressure is the pressure exerted by the water vapor in the atmosphere. If the atmosphere is kept saturated while temperature is increased, RH will continue to be 100%. However, VP will rise markedly, simply because at a higher temperature the atmosphere can hold more moisture. Since we dare not maintain 100% RH within a storage, another term becomes important---vapor pressure deficit (VPD). This value is the difference between the VP at saturation (100% RH) and that at whatever RH and temperature exist at a given time. VPD is extremely important, because rate of moisture loss is directly proportional to it.

VPD increases sharply as RH falls at a given temperature, or as temperature rises and RH remains constant, and it rises extremely fast as temperature rises and RH falls. This is illustrated in Table 1. At 32° F, VPD increases from 0.229 to 2.290 as humidity drops from 95% to 50%; and at a constant 95% RH, the VPD increases from 0.229 to 0.887 as temperature rises from 32° to 68° F. The meaningfulness of these figures lies in the fact that rate of moisture loss is directly proportional to VPD, and that a fair estimate of the differences in effects of various conditions on rate of moisture loss can be found by dividing the larger VPD by the smaller VPD. Therefore, in our above examples, at 32° F moisture will be lost <u>10 times as fast</u> at 50% RH as at 95% RH (2.29 ÷ 0.229). Any comparison can be made among the values in Table 1, and so it can be seen that if fruit is changed from 32° and 95% RH, to 50° and 85% RH, rate of moisture loss will be increased 6 times (1.38 ÷ 0.229); or from 32° and 95% RH to 68° and 60% RH, moisture loss will be increased about <u>31 times</u> (7.016 ÷ 0.229). It should now be clear that both humidity and temperature are important factors influencing moisture loss. And, as temperature increases, humidity control becomes increasingly important in reducing moisture loss.

Table 1. Vapor pressure deficits at various temperatures and humidities.

Relative humidity (%)	Temperature (^{o}F) 32	41	50	68
	Vapor pressure deficit (mm mercury)			
100	0	0	0	0
95	.229	.327	.460	.877
90	.458	.654	.920	1.754
80	.916	1.308	1.840	3.508
70	1.374	1.962	2.760	5.262
60	1.832	2.616	3.680	7.016
50	2.290	3.270	4.600	8.770

The importance of moisture loss is obvious when fruits begin to shrivel. Their salability is rapidly lost. However, moisture loss can be significant even though shrivelling has not developed, because a fruit usually loses about 5% of its weight before any shrivelling occurs. This means that when fruits show traces of shrivelling, 5% of their weight---and 5% of your income---have literally evaporated. Conscientious maintenance of humidity, and reduction of moisture loss, will save you money.

Every storage should have a humidity gauge in it, and it should be read frequently. If RH falls below 90-95%, the room should be humidified, with care taken that RH does not greatly exceed 95%. Golden Delicious should always be stored in unsealed polyethylene bags, since they are exceptionally subject to moisture loss due to a poor wax covering on the skin. And, particular attention should be given to humidity control following storage when the fruits are at a higher temperature, because moisture is being lost rapidly.

If you are packing fruit in perforated polyethylene bags following storage, you need not worry about excessive moisture loss after storage, for humidity will almost always be near 100% in these bags. The problem under these conditions will be to prevent condensation of moisture in the bags, which will then stimulate fungal growth and subsequent fruit decay. Condensation will very quickly occur if warm packages are placed into cold storage.

Thus, we are back to our 2-pronged problem: to maintain humidity high enough to keep moisture loss at a minimum, yet low enough to reduce decay. This problem is important to anyone handling fresh fruits and vegetables, and it should be well understood.

****

FRUIT PRODUCTION AS RELATED TO BRANCH DIAMETER

Richard B. Taylor[1] and William J. Lord
Department of Plant and Soil Sciences

In a recent study, fruit production from apple spurs associated with branches of specific diameters was determined. Four trees each of 11-year-old McIntosh and Red Delicious and 13-year-old Cortlands were used in the study and the total percent of fruit harvested from branches of different diameters was determined.

For all 3 varieties, approximately 78% of the total fruit harvested were from spurs associated with branches of 1/2 inch to 1 1/4 inch diameter. The percent of fruit harvested from spurs on branches of 1/2 inch to 1 inch diameter was 40% for McIntosh and 53% for Red Delicious. However, for the Cortland variety 65% of the fruit came from spurs on branches of 1/2 to 1 inch in diameter, which indicates the "willowy" nature of Cortland wood.

The number of fruit harvested on all 3 varieties from spurs associated with wood greater than 2 inches in diameter was negligible. This information and that presented above indicates the importance of good pruning techniques and the encouragement of new vigorous wood. When pruning bearing apple trees, the drooping ends of branches and the downward growing laterals should be removed, leaving most of the upward and outward growing (and consequently younger) parts of the tree. Water sprouts which are out of place and limbs that tend to crowd others should be removed, also. What should be left in a bearing tree, after pruning is completed, is largely young or middle-aged fruiting wood, and no 2 branches trying to occupy the same space.

Considerable thought and experimentation now is being devoted to the development of tree walls which could be harvested by persons riding at various levels on a trailer as it moves down the tree row. This spring, the question arose as to what percentage of the crop on large apple trees could be harvested by reaching-in from the periphery of the branches. The data obtained in the study mentioned above indicate that approximately 60% of the fruit on 35 lower scaffold limbs on the 3 varieties could have been harvested by reaching-in from the tree periphery. Naturally, the percentage harvested would be influenced considerably by pruning, tree-size and other factors.

****

[1]Present address: ZigZag Road, R.D. #1, Albion, New York 14411

HOW MUCH DOES A PRESSURE-TEST TELL YOU?

William J. Bramlage
Department of Plant and Soil Sciences

Crispness is one of the most important attributes of apple quality, and consequently measurement of fruit firmness is an important index of quality. Firmness is most commonly measured with a Magness-Taylor pressure tester, an instrument first described in 1925, yet one which is widely used even today.

Because individuals use the pressure tester differently, the readings obtained by different persons often do not agree. However, if an individual is careful to apply the pressure tester in a consistent manner, his own readings taken on different fruit samples are usually rather comparable. I have found that if the fruit is tested against a solid surface (for example, a table top) and the plunger is inserted slowly, quite comparable results are obtained.

But how much does a pressure test tell you? Presumably, it is an index of fruit texture. During storage tests in the 1965-66 season, samples of McIntosh apples were pressure-tested and then were offered to a panel of 10-14 individuals to evaluate for texture under controlled conditions. These judges had to evaluate 6 different samples against a standard fruit sample, and evaluations were made at 15 different time intervals. In 27 of these comparisons, significant texture differences were detected by the panel, and in 23 of the 27 instances, significant differences had been measured with a pressure tester. In 7 other comparisons, samples with significant pressure differences were not detected as having significant texture differences by the panel. Because the overall test was a large one involving many samples, an average pressure difference of only 0.2 lbs. between samples (20 fruits per sample) was significant statistically. That such small differences in firmness could be so indicative of detectable texture differences is indeed remarkable. The conclusion is inescapable that pressure tests were a reliable index of fruit texture.

Pressure tests are very commonly used as a maturity index to determine time of harvest, and also as a means of predicting storage life or shelf life after storage. These usages are based on the fact that as fruits ripen, the layer of pectin between individual cells breaks down, causing the cells to separate to some degree and therefore to soften. As a maturity index, pressure tests are valuable if used along with other indices, but they certainly are not definitive guides to be used by themselves. As a means of predicting storage or shelf life, pressure test may be very misleading. This was clearly shown by our storage tests of the past 2 seasons.

In 1964, we harvested McIntosh at 2 stages of maturity and the pressure tests averaged 16.2 and 14.8 lbs., respectively. In 1965, fruits of approximately comparable maturity averaged 15.9 and 14.4 lbs. at harvest. Thus, if firmness were a reliable predictive index, the fruits should have responded similarly in both years to similar storage condi-

tions. However, they responded very differently, holding up quite well in storage the first year and deteriorating very rapidly the second year.

Pressure tests of the fruits at removal from storage in the first season were a good index of their subsequent shelf life. The firmer the fruits, the better they kept following storage. In the second season, however, firmness was very misleading. The fruits softened rapidly during storage, and the higher the temperature, the more rapidly they softened. Controlled atmosphere did not prevent this softening, and after 70-90 days of storage, CA fruits were significantly softer than ones from 32° F regular storage. Using firmness as a guide, we would conclude that CA had produced poorer fruits than regular storage after these storage intervals, and that the CA fruits would deteriorate more rapidly following storage than those from regular storage.

Such was not the case; the CA fruits held up better following storage than those from regular storage. They maintained a greener ground color and developed less internal breakdown than ones from regular storage. Furthermore, they developed no scald or brown core, whereas those from regular storage developed both disorders. As an index of post-storage shelf life, pressure tests were very misleading in comparing CA and air storages in this second year; thus, they cannot be relied upon as a predictive index.

In discussing pressure testing, mention should be made of a fairly recent innovation, the so-called Mechanical Thumb. This is a device which may be attached to a regular pressure tester and permits pressure testing without destroying the fruit. With the Mechanical Thumb, readings are made without removing the peel and they result in only a small bruise on the apple.

The Mechanical Thumb was developed primarily for use by inspectors, so that an adequate number of fruits might be sampled without destroying packed fruit. However, some interest has developed in its utility for other purposes. In a recent study (Proc. Amer. Soc. Hort. Sci. 87:100-103), Dr. G. E. Mattus of the Virginia Polytechnic Institute compared the use of a Mechanical Thumb with that of a regular pressure tester on over 1,300 lots of apples of 5 different varieties. He found that readings with the Mechanical Thumb were subject to influence by more variables than those taken with the pressure tester, and therefore were less reliable. It seems, then, that except in unusual circumstances where destruction of the fruit is a serious deterrent to taking adequate readings, the regular Magness-Taylor pressure tester is a more reliable tool than the Mechanical Thumb.

The results of our tests have shown that the reliability of pressure tests depends upon what they are used for. As an index of fruit quality, pressure differences were closely related to texture differences. As an index of maturity, pressure tests were useful. But used as a prediction of storage life or shelf life, pressure tests were sometimes grossly misleading.

****

Cooperative Extension Service
University of Massachusetts
Amherst, Massachusetts
A. A. Spielman
Dean and Director
Cooperative Agricultural Extension Work
Acts of May 8 and June 30, 1914

Official Business
379 - 8/66 - 904
Permit No. 1216

Penalty for Private Use to Avoid
Payment of Postage, $300.

FRUIT NOTES

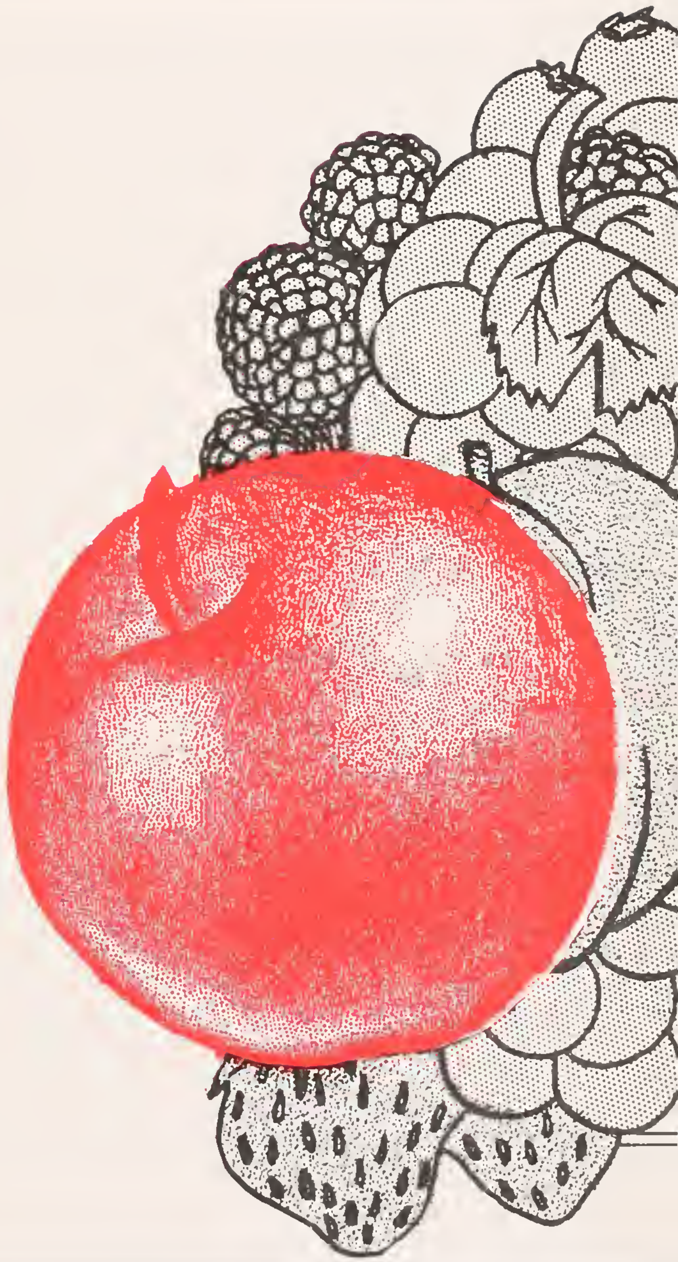
Prepared by the Department of Plant and Soil Sciences
Cooperative Extension Service
College of Agriculture
University of Massachusetts, Amherst

EDITORS

W. J. LORD AND W. J. BRAMLAGE

NOVEMBER–DECEMBER 1966

TABLE OF CONTENTS



Issued by the Cooperative Extension Service, A. A. Spielman, Dean and Director, in furtherance of the Acts of May 8 and June 30, 1914; University of Massachusetts, United States Department of Agriculture and County Extension Services cooperating.

A GROWER'S EXPERIENCE WITH DWARF APPLE TREES IN MASSACHUSETTS

Dominic A. Marini
Regional Agricultural Specialist, Southeast Extension Region

There is much discussion about the practicality of apple trees on EM IX rootstocks for commercial orchards. Advantages attributed to dwarf trees are: earlier bearing, higher yields per acre, and ease of pruning, spraying and harvesting. Few growers in New England have had actual experience with dwarf trees, however. Deciding to find out for themselves, the Morse family, operators of Pine Hedge Orchards in Wrentham, Massachusetts, established a planting of dwarf apple trees in 1961. Here is their experience to date.

The Morses planted a one-acre block to McIntosh, Cortland, Red Delicious and Golden Delicious, all on EM IX rootstock. A planting distance of 8 feet x 12 feet was selected, requiring 453 trees for the 1 acre block. The trees are supported on trellises of 7-foot-long, pressure-creosoted posts set 2 feet in the ground and spaced 24 feet apart. Four number 9 galvanized wires stapled to the posts complete the trellis. The bottom wire is 2 feet above the ground, while the others are spaced 1 foot apart above it. The cost of establishing this acre of dwarf trees was about $1,000 for trees, posts and wire, plus labor for which they have no record.

Eight limbs per tree are trained to the trellis -- 4 on each side of the main leader -- by twisting the limbs around the wire 1 or 2 turns. Spring type clothes pins are used to hold the branches in place. Wire "twistems" were found unsatisfactory since they frequently girdled the limbs, whereas the clothes pins expand as the limbs increase in circumference. Brittleness of the graft roots is the main reason why good support is essential for these trees.

Sod is permitted to grow between the rows and the area in the tree row is kept free of weeds by means of a Friday cultivator and the use of herbicides. The weed-free tree rows aid the mouse control program, which is critical, since mice are fond of these trees, and prevent weed growth into the lower branches of the trees.

The Morses used simazine to control weeds the first year after planting, but some of the trees were injured and about 10 trees died. (Insufficient agitation of the herbicide may account for part if not all of this damage.) Following the elimination of the grasses and broadleaf weeds with simazine, poison ivy flourished. At the sacrifice of 1-year's crop, amitrole was used to eradicate this obnoxious weed. In 1966, dalapon and 2-4 D (Dacamine 4D*) were used to control perennial grasses and broadleaf weeds with good results and there was no apparent injury to the trees.

The fertilizer program for the orchard has been horse manure supplemented with commercial fertilizer.

The Morses have found that the varieties differed considerably in the vigor of their response. Cortlands are extremely vigorous and difficult to confine within the alloted space. Golden Delicious are more vigorous than McIntosh, and Red Delicious trees are the least vigorous of the 4 varieties.

The earliest bearing trees produced their first crop in the third season (1963). In 1965, Cortlands produced 3/4 to 1 bushel per tree, McIntosh, about 1 bushel, and Golden Delicious, 1 to 2 bushels per tree.

In 1966, Cortlands produced slightly more than a bushel per tree, McIntosh, about 1/2 bushel, and Golden Delicious, 1 bushel per tree. There were only a few Red Delicious, some of which were 4 - 5 inches in diameter.

From their limited experience, the Morses have found that trellised trees produce well and require a minimum of care when once established. The trees begin to bear early, the fruit develop good color, and possibly the per-acre yield may exceed that harvested from trees on seedling roots. Pruning is relatively easy and can be done with inexperienced help. Although the Morses use their air-blast sprayer and spray 4 rows at a time, it could be done with a small sprayer equipped with a boom. Ease of harvest is a definite advantage. Ladders are not necessary and fruit can be harvested by women or high school boys. It is necessary to pick from each side of the row since lateral branches protrude in the row about 2 feet on each side of the tree. The Morses have found that preharvest drop is not a serious problem and that those fruit that do drop are not badly bruised.

The greatest problem encountered to date is the production of extremely large soft fruit with short storage life, particularly with Cortlands and Red Delicious. Weed control is another problem, but recently-labeled herbicides now make possible the control of a greater spectrum of weed species.

When asked what they would do differently if planting more dwarf trees, the Morses said they would thoroughly prepare the soil prior to planting. Rocks would be removed and organic matter would be worked into the soil. Under their conditions, Cortland and Golden Delicious would be spaced 10 feet apart in the row, while a more vigorous rootstock might be used for McIntosh and Red Delicious, such as Malling 26.

After 5 years experience with dwarf trees, the Morses feel that they are still in the experimental stage and that there are many unanswered questions. They are not "sold" on dwarf trees yet, and do not intend to plant more unless further experience indicates satisfactory performance.

****

POMOLOGICAL PARAGRAPH

Trees on Dwarfing Rootstock in New York State - The New York Fruit Tree and Vineyard survey reflects the national trend of increased plantings of apple trees on dwarfing rootstocks. Approximately 51 percent of the trees less than 12 years old in the western counties of New York State are on dwarfing rootstocks, and about 29 percent of the trees less than 12 years old in the eastern counties are on these stocks.

****

PRODUCTIVENESS OF BLUEBERRY VARIETIES

William J. Lord
Department of Plant and Soil Sciences

Dr. A.D. Draper, et al. (Maine Agr. Exp. Sta. Misc. Rpt. 118. 1966, pp. 93-96) reported that in replicated trials of blueberry varieties and selections that were set in 1959, Herbert, Bluecrop and Blueray produced the highest yields over a 4-year period (1961-64) at Hammonton, New Jersey. The mean yields per plant for these 3 varieties over the 4-year period were 11.0 pints, 9.2 pints and 7.5 pints, respectively. Collins, Berkeley, Earliblue and Coville, the other named varieties tested, produced mean yields over the same 4-year period of 4.7 pints, 4.1 pints, 3.9 pints and 3.0 pints, respectively. None of the selections yielded as well as Herbert, Bluecrop or Blueray.

Cross pollination was possible at the experimental site at Hammonton and the plants of all varieties and selections grew vigorously; therefore, Draper et al. concluded that the yield differences were largely a reflection of differences in fruit set and development.

In a recent letter to the writer, Dr. Draper stated that the unproductiveness of several varieties such as Earliblue and Coville appears to be related to pollination. Dr. Draper, who is a Research Geneticist with the Fruit and Nut Crops Research Branch of the U.S.D.A., further stated that they would continue to recommend Collins, Berkeley, Earliblue and Coville in areas of high bee activity. The Darrow variety, however, has been released as a possible replacement for Coville, but as yet the winter hardiness of this variety is not known.

****

A REMINDER ABOUT SAFE DISPOSAL

E.H. Wheeler
Professor of Entomology
Leader, Pesticide Chemicals Program

From an editorial in Pest Articles and News Summaries 12(3):116, published in Britain by the Ministry of Overseas Development and prepared by the Tropical Pesticides Information Service, to whose Editor acknowledgements are due.

"Just for once we are about to belly-ache about pesticides - and not, we believe, without just cause. We are alarmed at the increasing number of poison cases reported from various parts of the world and believe that more common-sense instruction is required.

"Death by poisoning is indeed a harrowing business as a glance at any poison manual will show. Headache, giddiness, blurred vision, weakness, nausea, cramps and diarrhoea; sweating, miosis, frothing at the mouth, vomiting, cyanosis, papilledema, convulsions, coma - followed by death in respiratory paralysis . . . . .

"It would be tragic indeed should it happen to one of our loved ones - a wife or child, through our own carelessness, thoughtlessness or neglect. Already there are more than enough of these gruesome cases.

"Even the minutest quantity of a toxic chemical left in a used container can be a real danger to children and animals, and it cannot be emphasized often enough - empty containers must be rendered harmless by thorough rinsing (water miscible residues only!), or destroyed by burning or buried.

"Partly full containers should always be stored tightly closed in a safe place away from feedingstuffs and out of reach of children.

"Play it safe. Bury the container, not the child!"

****

THE RELATIONSHIP OF FRUIT SIZE AND WATER CORE AND BREAKDOWN OF DELICIOUS

William J. Lord and Richard A. Damon
Departments of Plant and Soil Science and Statistics, respectively

It is stated in literature that water core is more severe in large than in small Red Delicious and that small apples make better recovery from this disorder. A study conducted by the authors during the 1963 - 1964 and 1964 - 1965 storage seasons showed that Delicious fruit that averaged 1/3 to 1/2 inch smaller diameter than other fruit from the same pickings were sometimes as severely affected with water core or internal breakdown as the larger fruit. Small but severely water-cored apples developed internal breakdown as soon during storage as the larger fruit. In both years, breakdown was present after 1 month of cold storage plus 7 days at room temperature, and at removal after 2 months of cold storage. Consequently, severely water-cored Delicious apples should be disposed of soon after harvest, regardless of fruit size.

****

BIRD DEPREDATION OF BLUEBERRIES AND ATTEMPTED CONTROL IN MASSACHUSETTS[1]

William J. Lord
Department of Plant and Soil Sciences

Both cultivated blueberries and lowbush blueberries are produced and sold commercially in Massachusetts. With a few exceptions, however, these are produced in many small plantings or fields by part-time farmers with several farm enterprises. More than 300 acres of cultivated blueberries are grown commercially throughout Massachusetts. The lowbush blueberry industry is centered in the Granville-Blandford area of Hampden County and in Northern Worcester County. Production of lowbush blueberries is estimated at 300 tons.

Complaints of Bird Damage Voiced Many Years

The location and proximity of most small cultivated blueberry plantings in Massachusetts to optimum songbird habitat makes them exceedingly vulnerable to depredation. For these reasons, damage has been severe and complaints loud and numerous. As a result of these complaints, a Bird Control Project was initiated in 1956 by the Department of Wildlife Management at the University of Massachusetts, with 3 major objectives: (a) to determine the species of birds doing the damage, (b) to determine the extent of damage, and (c) to attempt to find means of reducing or eliminating bird depredation. The results of the findings have been summarized at periodic intervals (2,3,5,6,7).

[1]Excerpts of talk presented at the North American Blueberry Workers' Conference, University of Maine, April 6-7, 1966.

Bird Species Causing Damage

Bird species causing damage to the cultivated blueberry crop are mostly songbirds, including robins, Baltimore orioles, bluejays, catbirds, towhees and sparrows; and blackbirds including starlings and grackles (5,6). Although species causing the damage varies considerably with the area because of behavior patterns, surrounding habitat and food preferences, Smith (8) in 1963, reported that robins were one of the greatest problem species.

Starlings are the main depredating species in lowbush blueberries in Massachusetts.

Extent of Damage

A substantial crop loss occurs each year in non-covered cultivated blueberry plantings. By questionaire and personal contact, it was determined that crop losses in cultivated blueberries for the years 1955-1958 were 38 per cent, 20 per cent, 19 per cent and 27 per cent, respectively (5). A survey was again conducted by Smith (7,8) in 1960 and 1961. Based on a 41 per cent questionnaire return, 27 per cent of the fruit on 310 acres of cultivated blueberries in Massachusetts were lost to birds in 1960. A 37 per cent crop loss occurred on 121 acres reported in 1961.

No known survey of bird damage to lowbush blueberries in Massachusetts has been conducted.

Control Methods

Numerous bird damage prevention devices have been used by growers and tested by graduate students working on the bird control project. To date, however, the only totally effective method of preventing bird depredation is by complete enclosure of the planting. Although many of the larger growers still rely on firecrackers and exploders, those with limited acreages now are covering their plantings.

Nettings of various types are available for exclusion of birds from blueberry plantings; many of which we have field tested: tobacco cloth, used fish net, kraft paper yarn, nylon, polyethylene and acrylic webbing.

A netting must be durable, economical and easy to handle. Large dimensions also are a desirable feature. Tobacco cloth lacks durability and tensile strength. The polyethylene net tested (7/16" or 1" mesh) lacked tensile strength and its use was abandoned after one year's test. The net with 7/16" mesh, however, would be of value for protection of strawberries against bird depredation because generally no framework is built over the plants. Some of the nettings require considerable sewing together at the initial installation due to their small width; for example, kraft paper yarn and nylon. Used cotton fish netting, which is sold by the pound, has small holes that must be patched and is difficult to handle in comparison to nylon net. Although we have not field-tested the net, nylon fish net now is available. The main advantages of fish netting are low initial cost, tensile strength and large dimensions.

Since 1960, when we suggested to the distributor that the used fish net would be of value to blueberry growers, an excess of 100 tons have been sold for this purpose. Initially, the netting came in odd shapes and lengths. Now the material is much more uniform and comes in widths of 60 to 130 feet and very large lengths.

The durability of the various nettings is unknown by us and the comments on the various nettings are based on field observations and not research. The kraft paper yarn and nylon nettings, given ordinary care will last many years. Our field test with cotton fish net indicates that it will last for at least 4 growing seasons.

Our limited observations of the acrylic webbing causes us to question the usefulness of this product for protecting cultivated blueberries from bird depredation. It is difficult to erect and keep in place and the fibers become entangled with the bushes and berries and cling to harvested fruit. Further testing of this material is needed, but at present we even question the usefulness of acrylic webbing for the home gardener.

The cost per square yard of netting is very variable -- 3 to 21 cents. When purchasing netting, prime considerations in addition to cost are: durability, ease of erection and space required for storage.

The cost of netting to enclose one acre of blueberries ranges from approximately $170 to $1190, depending on the type purchased. Although the initial cost of netting is high, the fruit saved and the increased size of berries makes enclosure of our cultivated blueberry plantings economically feasible. Blueberries increase considerably in size after first turning blue.[1] With netting, growers can delay harvest without fear of bird depredation.

New York Starling Trap

Bird depredation became a serious problem in the Granville-Blanford lowbush area about 5 years ago, with crop losses of 50% reported. Since covering these fields was not economically feasible, the New York starling trap was considered worth trying. Although crop losses were and are still high, growers feel that the trap has prevented heavier losses and in many cases saved their crop. For best results: place the traps on high ground, keep them clean, keep well supplied with fresh water and bait, and always leave 5 to 10 birds in the traps to attract others. One trap to each 15 to 20 fruiting acres seems adequate. A wide variety of baits are used: blueberries, grain, cherries, and apples. Trapped birds can be humanly disposed of by covering the trap with plastic and gassing.

Although live traps of the type mentioned are legal in Massachusetts, they are less prone to public criticism when used in isolated plantings.

---

[1] Based on 5680 square yards: 4850 to cover top and 840 for the sides. The square yards for the sides were figured for an area 210' x 210' with 9' sides.

The use of the New York starling trap in most cultivated blueberry plantings is limited since the principal depredating species are songbirds which must be released. One Massachusetts grower has reported the New York starling trap helpful, however (4).

Research on Bird Control Continues

The bird control research by the Department of Forestry and Wildlife Management has turned to more basic biology of the individual depredating species. Hester (2), in 1963, banded several bird species at the University orchards to trace bird movements. Captured and banded birds remained local for some time after being released, but most did not revisit the orchard. Behavioral studies with the Baltimore oriole by Hester (2) showed that transporting this species 2.1 miles from point of capture before releasing, had some effect on movement back to point of capture. Both Smith (8), in 1963, and Hirth (3), in 1966, reported that robins have a strong affinity for a particular fruit planting and that practically no population turnover occurs when the fruit crop is ripe. Being captured in nets, banded, and wing-tagged apparently failed to act as a deterrent to robins (3).

Observations made by Hirth (3), in the University of Massachusetts fruit planting, indicate that after the second week in June, immature robins caused most of the damage. There is apparently no single explanation of how these immature birds find their way to feeding locations and fruit crops.

Blueberry plantings bordering bushy or wooded areas are prone to depredation by flocks of robins, since these areas constitute ideal sites for songbirds (3).

Summary

Bird depredation of fruit crops is a problem of great magnitude in Massachusetts. Therefore, many growers of cultivated blueberries now rely on nets to prevent bird depredation and growers of lowbush blueberries have found that the New York State Starling Traps have prevented heavier losses to birds. These devices are merely stop-gap answers to the problem, however, and better bird control techniques are needed.

LITERATURE CITED

1. Bailey, J.S. 1964. Increased blueberry profits: a speculation. _Fruit Notes_. July 10th issue: 1.

2. Hester, A.E. 1963. Bird damage research in Massachusetts. _Fruit Notes_. February 28 issue: 1-2.

3. Hirth, D.H. 1966. Bird damage research. _Fruit Notes_. March-April issue: 2-4.

4. Marini, D.A. 1965. Observations on bird control. _Fruit Notes_. November-December issue: 7-8.

5. Pike, D.B. 1960. Research findings on bird control in small fruit plantings. Fruit Notes. March 15th issue: 3-5.

6. Smith, R.N. 1961. Bird damage to fruit. Fruit Notes. April 5th issue: 1-3.

7. __________. 1961. Bird damage to Massachusetts cultivated blueberry and peach crops. 1960. Fruit Notes. May 5th issue: 2.

8. __________. 1963. A study of environmental and population factors in relation to damage to orchards caused by birds. Master's Thesis. Department of Wildlife Management, University of Massachusetts, Amherst.

****

All pesticides mentioned in this publication are registered and cleared for the suggested uses in accordance with state and federal laws and regulations. Where trade names are used for identification, no product endorsement is implied nor is discrimination intended.

WARNING: MOST PESTICIDES ARE POISONOUS. READ AND FOLLOW ALL DIRECTIONS AND SAFETY PRECAUTIONS ON LABELS, HANDLE CAREFULLY AND STORE IN ORIGINAL CONTAINERS WITH COMPLETE LABELS, OUT OF REACH OF CHILDREN, PETS AND LIVESTOCK.

Cooperative Extension Service
University of Massachusetts
Amherst, Massachusetts
A. A. Spielman
Dean and Director
Cooperative Agricultural Extension Work
Acts of May 8 and June 30, 1914

Official Business
387 – 12/66 – 926
Permit No. 1216

Postage and Fees Paid
United States Department of Agricultur

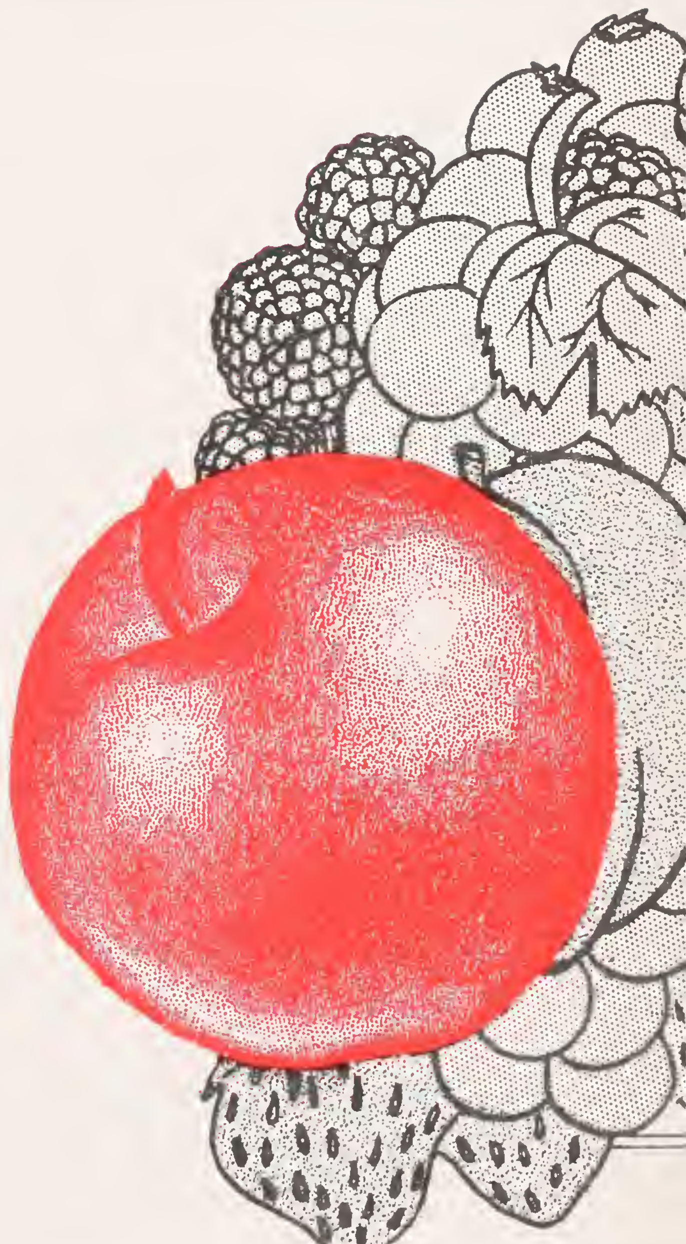
FRUIT NOTES

Prepared by the Department of Plant and Soil Sciences
Cooperative Extension Service
College of Agriculture
University of Massachusetts, Amherst

EDITORS
W. J. LORD AND W. J. BRAMLAGE

JANUARY—FEBRUARY 1967

TABLE OF CONTENTS



Issued by the Cooperative Extension Service, A. A. Spielman, Dean and Director, in furtherance of the Acts of May 8 and June 30, 1914; University of Massachusetts, United States Department of Agriculture and County Extension Services cooperating.

COLD INJURY TO PEACH TREES

William J. Bramlage
Department of Plant and Soil Sciences

In a talk given last year in New Jersey (Horticulture News 47: 26-34), Dr. E.F. Savage described some very interesting findings in Georgia about cold injury to peach trees.

Growers in the Coastal Plain area of Georgia have always been plagued by the very short life of their peach orchards---the average life of trees there is only 8 years. Many years of investigations showed that nutrition, diseases and nematodes all may play a part in this problem, but the basic cause was not uncovered. However, recent findings seem to have pin-pointed this basic cause: it appears to be cold injury.

This cold injury usually occurs in early spring when the trees have become physiologically active, not during the winter when the trees are in their rest period. And it does not have to get very cold to produce injury; in 1949, a low temperature of 26°F. killed thousands of trees. The injury occurs primarily in the cambium and phloem tissues, and appears as a discoloration in the cambium extending from the ground level upward to 2-3 inches above the crotch along the scaffold limbs. After a few warm days, a characteristic "sour sap" odor resulting from fermentation of the injured tissues occurs.

Results of studies by Dr. Savage's group at Experiment, Georgia, are rather startling. They have found that tree trunk temperature is much higher in winter than in summer. This happens because in the winter solar radiation penetrates directly into the bark, and is absorbed by the dark-colored bark. Such large amounts of heat are accumulated that trunk temperature may rise 40°F. or more <u>above air temperature.</u> This situation does not occur in the summer because (1) the trunk is shaded by leaves and (2) cool water is being drawn through the trunk, from the soil to the leaves.

Of course, these high trunk temperatures persist only during daylight hours. At night, trunk temperatures fall to near air temperature. Thus, if a bright, sunny day is followed by a cold night, violent fluctuations of trunk temperature can occur. For example, Savage described a sunny, 66°F. day followed by a 4°F. night in 1963---the tree trunks were exposed to about a 100°F. temperature drop in 10 hours. If the tissues are dormant, they may survive such a shock, but if they are physiologically active, severe injury and subsequent death of the tree can be expected.

An important factor in this situation is trunk size. The larger the trunk, the more heat will be absorbed and retained during solar irradiation. Seldom does injury occur to less-than-4-year-old trees, simly because they do not absorb as much heat and therefore experience such violent temperature fluctuations. This is also why most of the injury occurs in the trunk rather than in scaffold branches.

Another important factor is wind. On a bright, sunny day, heat will not accumulate in the trunk if a mild breeze is blowing, so wind can be a protective influence. But at night, a wind will significantly lower the temperature of the trunk on the windward side, and therefore may be a damaging influence.

It should be clear, then, that this cold injury is the result of a combination of environmental and physiological factors. Work is now under way in Georgia to find an economical way to protect the trees from this injury. It has been found that wrapping trunks with aluminum foil backed with fiberglass is effective protection, but it is not economical.

Do these results obtained in Georgia have any application to us in New England? They do indeed! Eggert reported from New Hampshire some years ago (Proc. Amer. Soc. Hort. Sci. 45: 33-36) that between December, 1943, and March, 1944, peach tree trunks reached 60°F. or higher on 18 different days, and reached 80° or higher on 5 different days. On most of these days, air temperature was at or below 32°F. He found that trunks of apple trees, on the other hand, underwent far less severe temperature fluctuations, and this difference between kinds of trees he attributed to differences in smoothness, thickness, color, and texture of their bark.

How much can be done practically to reduce cold injury to trees is highly debatable. Nevertheless, the findings of Dr. Savage's group should help us to understand why trees respond to their environment in the way that they do, and should help us to evaluate problems that may develop.

****

NEW EARLY APPLE VARIETIES

Walter D. Weeks
Department of Plant and Soil Sciences

Quinte — Quinte originated in Canada. It is one of the earliest red varieties to be released in recent years. It ripens just after Lodi and seven to ten days before Melba. Quinte is an attractive red apple with fruit quality equal to Melba. As it is not a large apple, it may require thinning to get good size in some locations. The tree is hardy and it bears annually.

Julyred — Julyred is a New Jersey introduction. It ripens about a week before Melba. The fruits are an attractive medium red. Fruit quality is good, it has better shelf-life and shipping ability than most early summer varieties. Julyred is a promising new early dessert variety.

Tydeman's Red A promising late summer apple from England which ripens about three to four weeks before McIntosh. The fruit is attractive, bright red and has good quality. Habit of tree growth is poor as it makes a straggly growth.

Niagara A good quality McIntosh type apple from New York, which ripens about ten days to two weeks ahead of McIntosh. Niagara is similar to McIntosh in tree and fruit characteristics.

While we have these new early apples in our plantings at the Horticultural Research Center in Belchertown, they have not yet fruited. The descriptions of the varieties are based on their performance in other locations. However, we feel they are worthy of limited trial by growers interested in extending their harvesting and marketing season.

****

POMOLOGICAL PARAGRAPHS

William J. Lord
Department of Plant and Soil Sciences

Bird Damage to Apples: A 3-year study of bird damage on apples (Proceedings of the American Society of Horticultural Science 85: 66-72) conducted by Lloyd A. Mitterling, University of Connecticut, Storrs, Connecticut, in a 9-acre orchard containing the varieties Cortland, McIntosh and Richared Delicious, among others, indicated that the birds preferred them as food in the order listed. Most of the damage was caused by bluejays which preferred Cortland. Crows, orioles, robins and starlings also fed on apples. The damage in apples was greater on trees at the periphery of the orchard than in the center of the orchard.

****

Suitability of Blueberry Varieties for Freezing: James F. Gallender and Harold Stammer, Department of Horticulture, Ohio Agricultural Research and Development Center, Wooster, Ohio, studied the suitability of 18 cultivated blueberry varieties for freezing as related to the quality---flavor, color and texture of thawed berries. Although all 18 varieties were acceptable, the following varieties tended to have better quality upon thawing and were recommended for freezing: Jersey, Coville, Dixi, Cabot, Earliblue, Berkeley, June, Adams, Atlantic and Pioneer. - (Fruit Crops Research. - 1966, Research Summary 6, August, 1966. Ohio Agricultural Research and Development Center, Wooster, Ohio.)

****

PLUM VARIETIES FOR MASSACHUSETTS

James F. Anderson
Department of Plant and Soil Sciences

Variety	Recommended for	Harvesting Season
Burmosa (J)	T	Late July
Formosa (J)	C - H	Early August
Shiro (J)	T	Early to mid-August
Great Yellow (J)	T	Early to mid-August
Santa Rosa (J)	C - H	Mid-August
Yakima (E)	C - H	Late August
Bradshaw (E)	H	Late August
Elephant Heart (J)	T	Early to mid-September
Imperial Epineuse (E)	H	Early to mid-September
Stanley (E)	C - H	Early to mid-September
Bavay (E)	H	Late September
Oneida (E)	T	Late September

(J) Japaneses Species (E) European Species

T - Trial H - Home C - Commercial
Varities so marked are not equally adapted to all sections of the State.
Note: To insure successful pollination, it is advisable to plant more than one variety of a particular species.

Variety Notes

Burmosa

The tree is small in size, medium in vigor and tends toward biennial production. The fruit is yellow with a bright red blush, becoming comletely overlaid with red, attractive, medium to large in size, freestone and good in flavor.

Formosa

The tree is large, vigorous and moderately productive. The fruit is large, attractive and the yellow color tends to become completely overlaid with red as the fruit ripens. The flavor is very good and the fruit holds very well in storage.

Shiro

The tree is medium is size and vigor. Shiro tends to overset and thinning may be necessary to maintain good fruit size and annual production. The fruit has a very attractive, bright yellow color, is of medium-small size and good flavor.

<u>Great Yellow</u>

The tree is medium in size and vigor and a good producer. The fruit is medium to large in size, good to very good in flavor and a freestone. The fruit hangs well on the tree, but there is a tendency for the skin to pull away at the stem when the fruit is picked late. Great Yellow is superior to Shiro in size and flavor, but rates lower in firmness and coloring.

<u>Santa Rosa</u>

The tree is large, vigorous and moderately productive. The fruit is large, reddish-purple and good in flavor. The fruit keeps and ships well.

<u>Yakima</u>

The tree is large, vigorous, upright and moderately productive. The fruits are large, prune-shaped, reddish-purple, freestone and of good quality.

<u>Bradshaw</u>

The tree is medium to large in size and productive. The fruit is above medium size, blue and of good quality. Bradshaw is recommended for those who desire a succession of varieties in the home garden.

<u>Elephant Heart</u>

The tree is large and vigorous. The fruit is very large, dark red and heart-shaped. The flesh is blood-red in color and good in quality. Elephant Heart is a desirable variety where high yields can be maintained.

<u>Imperial Epineuse</u>

The tree is large, upright-spreading and productive. The fruits are reddish-purple in color, medium to large in size and of excellent flavor. This rather unattractive prune is recommended for the home orchard where high quality is desired. This variety is highly susceptible to brown rot.

<u>Stanley</u>

The tree is medium in size, vigorous and productive. This attractive blue prune is medium to large in size and very good in quality. Stanley is a desirable variety for canning.

<u>Bavay</u>

The tree is large, upright, vigorous and moderately productive. This green gage type plum is of medium to small size, unattractive, but of high quality. Bavay is recommended for the home garden.

Oneida — The tree is medium in size, vigorous and productive. The fruit is large, reddish-black, prune-shaped and very good. Oneida keeps well in storage and appears to be worthy of trial where a late ripening plum is desired.

****

VARIETIES OF STRAWBERRIES FOR MASSACHUSETTS

James F. Anderson
Department of Plant and Soil Sciences

Variety	Recommended for	Harvesting Season
Earlidawn	C	Very early
Midland	C & H	Early
Redglow	C & H	Early- midseason
Surecrop	C	Midseason
Midway	C & H	Midseason
Catskill	C & H	Midseason
Fulton	C	Midseason
Robinson	C	Midseason
Fletcher	C & H	Midseason
Garnet	T	Mid-late
Sparkle	C & H	Mid-late
Frontenac	C	Late
Vesper	C	Very late

T = Trial H = Home garden C = Commercial

Varieties so marked are not necessarily equally adapted to all sections of the state.

Variety Notes

Earlidawn — A very early ripening variety. The fruits are of medium size and of fair to good flavor. The plants are productive and of moderate vigor. Earlidawn is recommended where red stele is not a factor.

Midland — An early ripening variety with large firm fruit of very good flavor. Midland produces many large, coarse berries and the berries are inclined to be dark in color. Good yields are obtained only with virus-free plants. Midland is not resistant to red stele.

Redglow — This early-midseason variety is vigorous and productive. The berries are of good size, very attractive and of good flavor. Redglow is resistant to the common strain of red stele.

<u>Surecrop</u> Recommended largely because of its resistance to several strains of red stele. The fruits are attractive, medium in size and fair to good in flavor. The plants are vigorous and moderately productive.

<u>Midway</u> The fruit is of good size, a deep red color, glossy and very good in flavor. The plants are vigorous, productive and resistant to the common strain of red stele.

<u>Catskill</u> A leading commercial variety with many growers because of its large size, attractiveness, good quality and vigorous, productive plants. Quite susceptible to leaf spot and requires a high level of fertility for good production. A good freezer.

<u>Fulton</u> The plant is vigorous, a good runner producer, very productive and free of leaf diseases. The fruit is of medium size, attractive, very firm and of very good flavor. Fulton is not resistant to red stele.

<u>Robinson</u> Its large, attractive, bright red fruit, high yield and abundant runner production have made this variety commercially important in many parts of the state. The quality and firmness of the fruit are below average.

<u>Fletcher</u> The plant is vigorous, a good runner producer and productive. The fruit is of medium size, firm, attractive, very good in flavor and is said to be excellent for freezing. Fletcher is not resistant to red stele.

<u>Garnet</u> The plant is vigorous, forms a full bed and is productive. The berries are large, attractive, moderately firm and have a good flavor. Garnet is not resistant to red stele.

<u>Sparkle</u> One of the important late season varieties. Its outstanding values are productiveness, firmness, good quality, and resistance to red stele disease. Berry size is medium to large in early pickings but tends to decline rapidly. It is rated as a good freezer.

<u>Frontenac</u> The plant is large and forms sufficient runners for a good bed. The fruits are large, long, wedge-shaped, medium to dark red in color, moderately firm and good in flavor. Frontenac is considered to be excellent for freezing. This variety is not resistant to red stele.

<u>Vesper</u> The plants are large, vigorous and productive. The fruit ripens late, is very large in size, attractive, moderate in firmness and good in flavor. Vesper has prominent protruding seeds. This variety merits trial because of its large size, attractiveness, lateness and productiveness. Vesper is not resistant to red stele.

****

NEWER VARIETIES WORTHY OF TRIAL

James F. Anderson
Department of Plant and Soil Sciences

The following report briefly describes some of the newer or less common fruit varieties under test in the University plantings that may be worthy of trial by commercial growers and home gardeners. Since the performance of a variety is greatly influenced by climatic, soil and cultural conditions, it is suggested that any new variety be tested on a small scale before planting it on a commercial basis.

PEARS

Chapin — A seedling of Seckel that is harvested in early August. The fruit is small to medium in size, green with a red blush. Chapin resembles Seckel except for a more prominent neck. The flesh is fine textured, juicy, free of grit cells and of good quality.

Starkrimson — A red bud sport of Clapp Favorite. The fruit is similar in size, shape and quality to Clapp, but has a solid red surface color. The fruit was harvested August 20th and held up well in storage to early December. This variety would add color and interest to a pear display, but we are not certain as to the buyers' reaction to a red pear.

Grand Champion — A russet sport of Gorham, which it resembles in size, shape and quality. The fruit is overlaid with a uniform cinnamon russet and is very attractive. The trees in our planting are too young to evaluate as to productivity.

Packham's Triumph — The fruit is large in size, greenish yellow in color, free from blemishes and although the surface is somewhat rough it is an attractive pear. The flesh is white, fine melting, free of grit cells and of very good quality. The fruit is harvested in late September and holds up well into early January. As the fruit was harvested from a top-worked tree, an evaluation of tree characteristics cannot be given.

Alexander Lucas — A late ripening pear of medium size, smooth surface, obovate, obtuse-pyriform shape and greenish yellow color. The fruit is of good quality. Alexander Lucas was harvested in the third week of September and keeps well into December. Production appears to be satisfactory.

Dumont — A late ripening pear of medium size, obtuse pyriform shape and yellow color. The flesh is firm, juicy and the quality very good. The fruit is harvested in late September and has kept well into early January in the past years. The variety has been productive under our conditions and is worthy of trial.

PLUMS

Washington — A large, high quality, green gage plum ripening in late August. This old variety is seldom grown today because of its reputation for poor production, however, the trees in our Amherst orchards have been very productive. The color of this European plum is not especially attractive and there could be some resistance by those unaware of its excellent flavor.

Howard Miracle — A large, attractive, high quality Japanese plum. The fruit is golden yellow with a light red blush. The firm-fleshed, freestone was picked in late August. Production was very good this year. The flavor of this variety is not typical of a plum and might be objectionable to some.

Pacific — An attractive, blue prune type plum of good quality. The fruit is quite firm and the keeping quality is excellent. Pacific has been a good cropper in Amherst, but ripening is quite uneven. The fruit begins ripening in the second week of September. Pacific is a European type plum.

Mohawk — This variety, along with Oneida and Iroquois, was recently named by the Geneva Experiment Station. Mohawk is an attractive blue prune, ripening in late August. The size is medium to large and the quality very good. Production has been moderate. Mohawk is said to be self-unfruitful.

Iroquois — An attractive blue prune that ripens in early September about a week before Stanley. The fruit is of medium size, longer than Stanley and of good quality. The tree is productive. There was some splitting of the fruit when the trees first came into bearing. Iroquois is said to be self-fruitful

STRAWBERRIES

Gala — A very early-ripening variety recently named by the New York Agricultural Experiment Station. In trials at the University, the berries were medium in size, moderately firm, slightly rough and irregular in shape. The plants were vigorous and moderately productive.

Sunrise — This new red stele resistant, early ripening variety was fruited in our plots in 1958, 1959, 1960 and 1961. The fruit was bright red, glossy smooth and uniform in shape. The size is medium to small and variable. The plants were vigorous and made a good bed. The relative yield was fair. Sunrise may be worth testing where an early ripening variety is desired and red stele is a problem.

****

Cooperative Extension Service
University of Massachusetts
Amherst, Massachusetts
A. A. Spielman
Dean and Director
Cooperative Agricultural Extension Work
Acts of May 8 and June 30, 1914

Official Business
392 – 1/67 – 950
Permit No. 1216

Postage and Fees Paid
United States Department of Agriculture

FRUIT NOTES

Prepared by the Department of Plant and Soil Sciences

Cooperative Extension Service

College of Agriculture

University of Massachusetts, Amherst

EDITORS

W. J. LORD AND W. J. BRAMLAGE

MARCH – APRIL 1967

TABLE OF CONTENTS

Issued by the Cooperative Extension Service, A. A. Spielman, Dean and Director, in furtherance of the Acts of May 8 and June 30, 1914; University of Massachusetts, United States Department of Agriculture and County Extension Services cooperating.

ECONOMIC CHANGES IN MARKETING FRUITS AND VEGETABLES IN THE UNITED STATES

Excerpts from
Remarks by Floyd F. Hedlund[1] at the
XVII International Horticultural Congress,
University of Maryland, College Park, Maryland,
August 19, 1966

(Every fruit grower knows that the marketing of fresh fruits and vegetables has changed greatly in recent years, and is continuing to change. This presentation by Mr. Hedlund discusses the national economic changes that are occurring in marketing, and should give New England growers a clearer view of the changes occurring in their markets---Editors.)

The food industry--the business of feeding our people--is this country's largest industry. The food bill in the United States amounts to $85 billion annually. Fruits and vegetables are a significant part of the food business. Nearly 25 percent of retail grocery store sales of food are accounted for by fresh and processed fruits and vegetables. Each person in the United States on the average consumes about 500 pounds of fruits, vegetables, and potatoes each year.

The United States farmer, during the first quarter of this year, received--on the average for all products--41 percent of the consumer's food dollar. The farm to retail spread, amounted to 59 percent. For fruits and vegetables, the farmer received 27 percent. The remaining 73 percent of the consumer's fruit and vegetable dollar covered all marketing and processing costs. This spread reflects the high degree of processing, packaging, refrigeration, and special handling required in the marketing of fruits and vegetables.

Production Picture

Eight million acres in the United States are devoted to the production of horticultural commodities. These include nearly three million bearing acres of fruit and tree nuts. Last year's production of fruits and vegetables total 55 million tons--15 million of potatoes and sweet potatoes, nearly 20 million of vegetables, and 20 million of fruit and tree nuts. Over the years, production of these commodities has trended upward, exceeding slightly the increase in population.

Cash receipts by farmers from fruits and vegetables total $4 billion a year, or more than 10 percent of the total of $37 billion from all agricultural production including both crops and livestock. Receipts from fruit and tree nuts totaled about $1.75 billion, and those from vegetable crops $2.25 billion.

A generation ago, a typical farmer produced food and fiber for 10 persons--today for 37 persons. Disposable personal income on a per cap-

[1] Floyd F. Hedlund, Director, Fruit and Vegetable Division, Consumer and Marketing Service, U.S. Department of Agriculture, Washington, D.C.

ita basis is five times the level of 30 years ago. This is reflected in increased consumption of fruits and vegetables. Consumer preferences have resulted in shifts to convenience foods and to new products. This has been reflected in increased processing. Thus our markets in total are larger not only because of more people, but because of the effect of urbanization. But more significantly, these markets are constantly changing because of the wants and preferences of people and larger incomes to satisfy these desires.

Changing Patterns of Consumption and Market Structure

Per capita consumption (on a farm weight basis) of fruits has increased nearly 10 percent over the past 30 years, while that for vegetables has increased by 25 percent. However, there has been a material shift from fresh use to processing. For example, consumption of all fruits in fresh form has been reduced by one-third, while that in processed form has more than doubled.

There have been many changes in wholesale distribution over the years. Even though the volume of fruits and vegetable marketed has been increasing, a smaller volume is being handled by terminal market wholesalers. Direct buying by large retail organizations--both corporate and voluntary chain--has had a sharp impact on the wholesale markets. The decreasing volume handled has been reflected in a sharp reduction in the number of wholesaler firms. Wholesalers have moved toward providing specialized services for customers, such as institutional outlets and groups of retailers, either wholesaler-sponsored or where the retailer group sponsors the wholesaling operation. The importance of auctions has been declining. A major trend in wholesaling has been the relocation of terminal markets from the old center city locations to suburban areas, where more adequate facilities can be built.

About two-thirds of the fresh fruits and vegetables move to market by motor truck. This is in sharp comparison to a generation ago when most shipped-in supplies moved by rail. Trucks have been steadily increasing their share of the produce transportation business. More rapid service and direct delivery are among the major advantages of truck shipments. Much of the shift to trucks has been in short and medium haul business. However, trucks are gaining in importance even on the long haul from Pacific to East Coast.

The food retailing industry under the various pressures of changing technology and competition has moved in the direction of general, as contrasted to specialty food stores, of larger stores, and of larger firms. The modern supermarket is made possible by the mobility of consumers, arising from the automobile and improved highways. In 1965, there were 227,000 grocery stores, barely half the 440,000 in existence in 1935. Sales were nine times those of thirty years earlier. Average dollar sales per store increased eighteenfold during this period. The growth in number of items handled has been spectacular, increasing from less than 900 in 1928 to 3,000 in 1946; to 4,700 in 1955; to 7,100 in 1965.

Over the past several years there has been an expansion in so-called "convenience stores." These stores are relatively small in size and provide quick, easy-to-shop facilities, and remain open at late hours.

Impact of Changing Market Structure

The changing structure of both production and marketing has had sharp impact upon the relationship among and within groups in the fruit and vegetable industry. Marketing today is a complex matter and a highly competitive business. The picture is complicated by various integration and contractual arrangements and by the quality and quantity requirements of a mass distribution system. Producers have responded in various ways to the changing market structure.

Production has been concentrated in fewer hands and many farmers have turned to cooperatives, bargaining associations, marketing orders, and other arrangements in efforts to assure themselves of a voice in and a larger share of the returns from the processing and marketing of their production.

Farmers, through marketing cooperatives, have sought to improve their returns and to achieve greater bargaining power. Cooperatives have been most successful in connection with fruits and of lesser importance in the marketing of vegetables. In a number of cases, grower cooperatives are involved in processing--as in raisins, dried prunes, and some fruits and vegetables. Several are dominant factors in the industry. There are approximately 650 fruit and vegetable marketing cooperatives with sales of fresh and processed products in excess of one billion dollars annually.

Promotion

Since few farmers are large enough to justify or support broad individual promotion of their product, various agricultural groups with common interest in particular commodities have given increased attention to promotion and advertising as a means of increasing demand for their products. In some cases dominant cooperatives have supported promotional activities over extended periods. In other cases, promotional efforts of producers have been supported by processors, shippers, retailers, or others in the industry. However, many agricultural groups engaged in promotion and advertising are organizations established pursuant to State or Federal legislation. These are usually operated as Commissions or Boards, and derive their funds through a small assessment on products marketed.

****

RECENT PUBLICATIONS

You may wish to send for one or more of the following publications:

1. Fruit Varieties in New York State: Berries. Extension Bulletin 1167.

2. Fruit Varieties in New York State: Apricots. Extension Bulletin 1168.

3. Raspberry growing in New York State. Extension Bulletin 1170.

4. Combating Replant Problems in Orchards. Extension Bulletin 1169.

All these publications are available from the Cooperative Extension Service, Cornell University, Ithaca, New York.

****

ZINC LEVELS IN MASSACHUSETTS APPLE ORCHARDS

W.J. Lord, Bertram Gersten and J.H. Baker
University of Massachusetts

Zinc deficiency in apple orchards has been considered a problem in western United States for many years, but only recently has it been of concern in New England. In 1965, Stiles and Goff in Maine presented data showing a relationship between zinc level and yield of McIntosh and suggested that this element may affect tree growth, limit yields, and affect fruit color development. Siles reported that 35 McIntosh leaf samples from Maine apple orchards in 1964 averaged only 8.0 ppm zinc. Since these orchards were considered to be highly deficient in zinc, a tentative optimum standard of 37.5 ppm has been suggested by Stiles. In contrast to these results, a block of McIntosh trees in central Massachusetts with a record of high yield (average yield in 1961 and 1962 was 50 bushels per tree per year) were found to contain only 10-12 ppm of zinc. These trees, though well below the proposed optimum levels for zinc, show no signs of zinc deficiency.

Critical level of a nutrient is the level above which a plant is amply supplied and below which it is deficient in that element. A <u>critical</u> level for zinc in apple leaves is difficult to establish from literature. Chandler <u>et al.</u> in 1934 reported 4-54 ppm zinc in deficient apple leaves in California orchards and 4-80 ppm in healthy leaves. Thomas <u>et al</u>. in 1949 found 14-65 ppm zinc in healthy young apple trees in Pennsylvania. In 1964, Uriu and Koch in California suggested that 13-14 ppm could be the borderline between zinc deficient and zinc sufficient levels. Heeney <u>et al</u>., in 1964, also suggested a critical level of 15 ppm of zinc for eastern Ontario.

Zinc Levels in Massachusetts Orchards

Leaf samples were obtained in several Massachusetts orchards in 1965 and again in other orchards in 1966 to determine zinc levels. Since Stiles indicated that manganese also might be critically low in Maine orchards--35 McIntosh leaf samples in 1964 averaged 6.4 ppm manganese--the level of this element also was determined. The data for the zinc and manganese levels in McIntosh trees sampled in Massachusetts are shown below.

Table 1. Zinc and manganese levels of McIntosh apple trees in several Massachusetts orchards.

Orchard	No. of trees sampled[1]	Zinc (ppm)	Mn. (ppm)
		1965	
1	12	11.8	-
2	5	18.8	-
3	4	14.0	37.0
4	4	17.0	36.3
5	5	18.6	39.2
6	6	13.3	26.3
7	5	17.4	79.4
8	5	11.8	154.0
9	5	14.4	26.4
10	40	13.2	32.0
Average		15.0	53.8
		1966	
11	5	21.0	29.4
12	5	14.2	65.2
13	5	10.4	76.8
14	5	10.2	72.8
15	5	11.0	38.8
16	5	9.8	41.4
17	5	9.8	29.4
18	5	11.8	45.0
19	20	13.4	-
Average		12.4	49.9

[1] Leaves from each tree constituted a sample

It can be noted in Table 1, that the average zinc levels of the McIntosh leaf samples in 1965 and 1966 were 15.0 and 12.4 ppm, respectively, which are higher than those reported by Stiles in Maine. The lowest zinc level found in any individual tree was 10 ppm in 1965 and 7 ppm in 1966. Zinc levels as low as 1.4 ppm have been reported in Maine.

Based on the critical levels suggested by Uriu and Koch and Heeney et al., it would appear that the zinc level in some McIntosh apple trees in Massachusetts may be at the critical level. Whether or not zinc treatments would be of value in some orchards is not known. For example, the trees in Orchard 1 (Table 1) are very vigorous and productive and exhibit no apparent visual symptoms of zinc deficiency. In fact, no definite visual symptoms of zinc deficiency have been observed on any of our visits to orchards. Benson, in Washington state, has said that the best guide to zinc needs in the Pacific Northwest is the visual appearance of symptoms. It will be of interest to examine trees in orchards 16 and 17 for visual symptoms of zinc deficiency in 1967.

Effect of Zinc Level on Tree Performance

In 1964, a soil management experiment was established in a block of 3-year-old McIntosh trees on EM VII in Shelburne, Mass. Since the nutritional status of these trees was known, it was of interest to compare tree performance as related to 2 levels of zinc by comparing the performance of those trees with 20+ ppm with those having 12 or 13 ppm in 1965. The calcium, magnesium, phosphorous, manganese, and iron levels of the "high" and "low" zinc trees did not differ, but nitrogen and potassium were somewhat higher in the "high" zinc trees.

Table 2. Terminal growth and fruit color of McIntosh as related to 2 levels of zinc.

No. of trees	Zinc 1965	Zinc 1966	Terminal growth[1] 1965	Terminal growth[1] 1966	Fruit color[2] 1965	Fruit color[2] 1966
	ppm	ppm	in	in		
9	23.6	21.6	18.8	15.4	60	69
14	12.7	13.2	21.4	15.6	61	73

[1]Average of 15 terminals
[2]Percent red color, average of 20 fruits

Although the experiment was not established to determine the response of McIntosh to various levels of zinc, it is apparent that the mean terminal growth and fruit color did not differ between the "high" and "low" zinc trees (Table 2). Since the trees with 12 or 13 ppm in 1965 are vigorous and show no visual symptoms of zinc deficiency, the critical level for zinc in Massachusetts appears to be below this level.

Soil Applications of Zinc

Soil applications of zinc sulfate have generally been unsatisfactory for the correction of zinc deficiency in apple orchards except occasionally on acid soils. Since our orchard soils are acid and tests with soil applications of zinc are more convenient than spray applications in grower orchards, a study of the effectiveness of a soil application of zinc sulfate for increasing the zinc level in a mature Northern Spy orchard was established in April, 1965. No increase in zinc level occurred in the leaves during the year of application (1965) or

through mid-July of 1966. Therefore, it was of interest to determine the zinc content of the grass and soil under the treated trees. The results of these analyses are shown in Table 3.

Table 3. Zinc level in grass and soil under Northern Spy trees after receiving a soil application of zinc sulfate.

Treatment[1]	Zinc (ppm) in grass 9/1/66[2]	Zinc in soil (ppm) on 9/1/66 at depths of:[3] 0-1"	1-2"	2-3"	3-4"	4-5"	5-6"	6-8"
Zn SO_4	69.2	200	14	5.7	2.7	1.9	1.7	1.6
Check	27.9	11	2.2	1.7	1.4	1.1	1.1	0.9

[1]Ten lbs. zinc sulfate applied April 14, 1965
[2]Ten trees per treatment
[3]Average of 5 treated and 5 untreated trees.

It can be seen in Table 3 that the zinc level of the grass in 1966 was increased by the soil application of zinc sulfate on April 14, 1965, and that most of the zinc is apparently fixed in the top 2 inches of soil. Why the zinc content of the apple leaves was not increased is not known. However, these data and the leaf analyes from several other trials of 1-year duration make us question the value of soil applications of zinc.

Summary

In preliminary trials, mean zinc levels in some Massachusetts apple orchards were found to be 15.0 ppm in 1965, and 12.4 ppm in 1966. Although some trees may be low in zinc, at present no visual deficiency symptoms have been observed and consequently zinc treatments are of questionable value in most orchards. The data also suggest that soil applications of zinc sulfate may be of no immediate value in raising the zinc level in apple leaves.

****

1967 GUIDE TO ORCHARD FERTILIZATION

W.D. Weeks
Department of Plant and Soil Sciences

Our basic suggestions for orchard fertilization have not changed from past recommendations. Nitrogen is still the key to a satisfactory fertility program and the rate of application to each tree should be adjusted to give the maximum yield of firm, highly colored fruit. A careful study of tree growth during the growing season and a check of the fruit at harvest can be most helpful in determining the nitrogen requirements of the tree.

Suggested rates of fertilizer for normal applications to bearing-age apple trees are given in the following table.

Normal Rates of Fertilizer for Bearing Apple Orchards

	Approximate Amounts per Tree					
Potential Bu. Yield of Tree	Nitrogen Required	Potash Required	Ammonium Nitrate	Muriate of Potash or	0-15-30	8-16-16
	Pounds	Pounds	Pounds	Pounds	Pounds	Pounds
Less than 15	0.66	1.3	2.0	2.1	4.3	8
15 - 25	0.66-1.00	1.3-2.0	2.0-3.3	2.1-3.3	4.3-6.6	8-12
More than 25	1.33-2.00	2.7-4.3	4.0-6.0	4.5-7.9	9.0-14.3	16-25

The suggested amounts of materials to apply in the table are for hand applications under the spread of the branches. When the materials are broadcast over the entire orchard floor, it may be necessary to increase the rate of application in order to obtain the same tree response as with the hand applications. Fertilizer materials other than those given in the tables may be used so long as they are applied at rates which provide equivalent amounts of nitrogen and potassium.

The tree's magnesium and calcium requirements can best be met by maintaining an adequate dolomitic liming program. The pH of orchard soils should be maintained between 6 and 6.5. If a soil test shows that the pH of soil is 5.5 or below, magnesium sulfate sprays should be applied to prevent possible occurrence of magnesium deficiency. It takes from three to five years before dolomitic limestone is effective in correcting magnesium deficiency. When magnesium sulfate sprays are used, apply two to three sprays of epsom salts at the rate of 20 pounds per 100 gallons of water. These sprays should be timed by calyx, first and second cover sprays. To avoid possible incompatibilities, the epsom salt sprays should not be combined with the regular insecticidal and fungicidal sprays.

Boron should be applied to orchard soils every three years. Borax is the most common material used. The rates of application per tree vary with age and size. Apply one-quarter pound of borax to young trees, one-half to three-quarters pound to medium age and size trees, and three-quarters to one pound to large or mature trees. Boron may be applied as a foliar spray. On an annual basis Polybor-2 or Boro Spray is applied at one-half pound per 100 gallons of spray one and three weeks after petal fall.

The amounts of fertilizer applied to trees which have received annual applications of 200 pounds or more of hay mulch per tree may be materially reduced or entirely eliminated. Tree performance should serve as a guide in determining the extent to which the rates of fertilizer may be reduced.

It is suggested that the need for minor elements be established before making extensive corrective treatments. Limited trials indicate that soil applications of zinc may not be effective in improving the zinc nutrition of the tree. While we have no evidence of widespread micro-nutrient deficiencies such as zinc and manganese, it is possible that some orchards may be approaching low levels of these elements. Studies in Maine indicate that when mild cases of these deficiencies occur, fung-

icides containing zinc and manganese may supply sufficient quantities of these elements to correct the deficiency. However, in severe deficiencies separate sprays containing zinc or manganese must be applied.

In young, non-bearing orchards, it may be possible to produce sufficient high quality mulching material for the young trees by broadcasting 500 to 800 pounds of mixed fertilizer per acre. Place the mulch in a band under the spread of the branches. The amount of fertilizer required for the trees with this system of culture will vary with the quantity and quality of mulch applied around each tree. If the trees are not making sufficient growth, one-eighth pound of ammonium nitrate per year of tree age may be applied to the mulch.

Recommendations for fertilizing peach orchards are given in the following table. The amounts given may need to be increased, if the trees are in a heavy sod. A suggested increase would be to double the amount of nitrogen.

Normal Rates of Fertilizer for Bearing Peach Orchards

Approximate Amounts per Tree

Tree Age	Ammonium Nitrate Pounds	Muriate of Potash Pounds	or 0-15-30 Pounds	8-16-16 Pounds
3 - 6	½ - 1	1 - 2	2 - 4	2 - 4
6 - 9	1 - 1½	2 - 3	4 - 6	4 - 6
9 - 12	1½ - 2	3 - 4	6 - 8	6 - 8
12 & over	2 - 4	4 - 8	8 - 12	8 - 16

****

FOLIAR CALCIUM SPRAYS FOR BITTER PIT CONTROL

Mack Drake and W.D. Weeks
Department of Plant and Soil Sciences

Foliar calcium sprays are recommended for bitter pit susceptible varieties, such as Baldwin, Northern Spy, and possibly Cortland and Red Delicious, especially on trees with a light crop or those that have produced pitted fruit in recent year.

We recommend using calcium nitrate (fertilizer or technical grade) at the rate of 5 pounds/100 gallons of water. A spreader or wetting agent such as Triton B should be used at the rate of 3 fluid ounces/100 gallons of water.

Apply 3 sprays at 2-week intervals. The first spray is applied about 2 weeks after petal fall. Preliminary tests indicate that 3 sprays are as effective as 6 or 9 sprays applied throughout the growing season.

It appears that the critical period for the initiation of bitter pit is in the early stages of fruit growth, rather than later in the season.

Without a surfactant, droplets of the calcium solution concentrate at the leaf margins producing a burn or scorch. Similarly, droplets concentrate on the fruit surface causing lenticel spotting.

Spray when good drying conditions prevail. Spraying when leaves are wet or in late afternoon increases the danger of leaf scorch.

Calcium chloride (technical or industrial grade) may be used at the rate of 3 pounds/100 gallons of water instead of calcium nitrate, but there is greater danger of leaf scorch from calcium chloride.

While foliar calcium sprays reduce the incidence of bitter pit, they do not eliminate bitter pit. We have not been able to obtain 100 percent control of the disorder in any four experiments.

****

Cooperative Extension Service
University of Massachusetts
Amherst, Massachusetts
A. A. Spielman
Dean and Director
Cooperative Agricultural Extension Work
Acts of May 8 and June 30, 1914
—
Official Business
398 — 3/67 — 955
Permit No. 1216

Postage and Fees Paid
United States Department of Agriculture

FRUIT NOTES

Prepared by the Department of Plant and Soil Sciences
Cooperative Extension Service
College of Agriculture
University of Massachusetts, Amherst

EDITORS

W. J. LORD AND W. J. BRAMLAGE

MAY–JUNE 1967

TABLE OF CONTENTS

Issued by the Cooperative Extension Service, A. A. Spielman, Dean and Director, in furtherance of the Acts of May 8 and June 30, 1914; University of Massachusetts, United States Department of Agriculture and County Extension Services cooperating.

TREE SPACING AND APPLE ORCHARD MODIFICATION

William J. Lord
Department of Plant and Soil Sciences

During the last 2 or 3 years, growers have been literally bombarded with talks at meetings and with articles in publications concerning tree walls, mold-and-hold pruning and size-controlled rootstocks. Along with these innovations has been a renewed interest in the age-old practice of scoring. The advocates of these practices are attempting to develop orchards with early and heavy production per acre from trees that can be harvested during a shorter period of time with the minimum of harvest laborers. Therefore, it is of interest to reflect on what we were doing in Massachusetts orchards before this bombardment, what is happening now, and what may happen in our orchards in the future.

What We Were Doing

During the 1950's, growers became concerned about the tree height in many of their older plantings with tree spacing of 40' x 40'. Many of these tall trees were in blocks originally planted 20' x 20', but growers had failed to restrict tree size and thereby lower limbs were "shaded out" and the trees grew tall from crowding.

The "Allen" way of lowering trees was introduced to Massachusetts in 1952, but growers finally settled for a more gradual lowering of trees to 18 feet or less. Since 1960, we have advocated restricting tree size and shaping trees like Christmas trees---branches in the upper half of the trees are cut back to insure the maintenance of vigorous and fruitful lower limbs.

From 1960 through 1965, 45% of the trees planted were on size-controlling rootstocks, with the majority on E.M. VII. These trees were spaced 20' x 30', giving 72 trees per acre. In a few orchards, however, growers experimented with trees on E.M. IX, with trees on E.M. VII spaced 20' x 15' and with plantings having off-set rows.

What is Happening Now

As a result of the bombardment with proposed orchard innovations, many growers are critically analyzing their orchards and their cultural practices. They know that productive, mature McIntosh trees planted 40' x 40' can produce yields of 1000 bushels or more per acre annually. But, it is many years before these trees at these planting distances attain sufficient bearing surface to produce these profitable crops! Therefore, growers reason that the answer to the problem of slow production increases is to plant a large number of trees per acre to obtain a large bearing surface early in the life of the orchard. Questions remain as to what dwarfing stock is most suitable and what tree spacing and pruning system to use.

At present, EM VII rootstock continues to be the preferred stock for McIntosh, but an increasing number of trees on Malling-Merton (M.M.) 106 are being planted. In fact, it appears that the demand for M.M. 106, exceeds the supply. Grower decision on rootstock for Delicious is not clear-cut, however. Although many are being planted on E.M. VII, some growers question the need for putting this variety on a size-controlling rootstock, since it is not as vigorous growing as McIntosh. Contrary to many other fruit growing areas, the number of spur Delicious being planted is limited.

The limited experience gained with trees of E.M. IX indicates that this rootstock is of questionable value even in orchards of growers who are willing to devote extra time to these plantings.

There is little interest in a planting system with off-set rows---interplants set to one side and between the trees in the row---as means for obtaining larger tree numbers per acre. Therefore, plantings with close spacing in the row and between the rows are being established by some growers---6' x 14', 10' x 18', 15' x 21' and so forth.

What May Happen in the Near Future

With a few exceptions, growers will devote only part of their acreage to close tree spacings, and it is doubtful that many plantings with spacing closer than 12' x 18' will be established. Unless something unforeseen happens, it also is doubtful that tree walls will become a reality, except on a very limited scale, because the bending and pruning techniques necessary for the development of the tree wall appear to be too laborious. Instead, the trees in these close plantings will be kept as individual units.

Trees in some of our older blocks will be gradually lowered to 12' to 14', and past experience indicates that this can be accomplished without too much difficulty.

Most growers, regardless of whether or not they have plantings with close tree spacing, will mulch and/or fertilize heavily the first 5 to 6 years to obtain a large bearing surface. The trees may be scored, particularly Delicious, to induce flower bud differentiation. Once the tree starts bearing, the rate of fertilization will be reduced to help red color development on fruit and to hold back tree size. Restriction of tree size by pruning will receive major emphasis, since trees of 14 feet or lower are desired. Restricting size and maintaining productivity of trees spaced 7' to 12' apart in the row will challenge the horticultural ability of the grower, however.

Summary

Plantings with close tree spacings will prove successful only if growers are willing to pay attention to details. A grower's ability as a horticulturist may play an increasingly important role in his success in the future. The ultimate answer as to the planting distance, height and spread of our trees is not known. Many of the answers may be found by the industry itself and probably no one system of culture will be prevalent.

****

THE HIGHBUSH BLUEBERRY INDUSTRY

William J. Lord
Department of Plant and Soil Sciences

It is evident from reading the Proceedings of the North American Blueberry Workers' Conference (Maine Agricultural Experiment Station Misc. Rpt. 118) that a rapid expansion of the highbush blueberry industry has occurred in some states during the last decade. On the other hand, in Massachusetts and all of New England, the industry has expanded slowly since the majority of the plantings are small and are being operated by part-time farmers. To give readers some pertinent facts about the highbush blueberry industry in the leading producing states, the writer has included below information obtained from the Proceedings of the North American Blueberry Workers Conference and from correspondence with blueberry workers from these states. Since blueberry acreage and production are not generally published in the USDA Crop Reporting Service, such data presented below generally are the best estimate from a variety of sources.

New Jersey

Frederick A. Perkins, Rutgers University, New Brunswick, New Jersey, reports that during the last 10 years, blueberry acreage in his state has increased about 60 percent and that there are now over 8,000 acres producing around 2 million trays (12 pints - 11 pounds) annually. Most of the acreage is in Burlington and Atlantic counties, located in southeastern New Jersey.

Bluecrop, Jersey and Weymouth varieties produce slightly less than one-half of the total commercial production. According to Perkins, the average yield in 1965 was estimated at 260 12-pint trays per acre.

During the 1950's, about 60 percent of the blueberries were sold for fresh fruit and 40 percent were sold for processing. In recent years, however, about 80 percent of the crop has been sold for fresh fruit.

Perkins stated, "New Jersey is the dominant supplier of fresh market, cultivated blueberries, with the season extending from around June 20 to August 20. The peak of production is marketed from July 10 to August 1st. Most of the berries are sold in large-city markets of New York, Philadelphia and Boston, with other shipments to major cities throughout the U.S."

North Carolina

Gene J. Galletta, Department of Horticulture Science, North Carolina State University, Raleigh, North Carolina, reports the following information about the North Carolina blueberry industry.

The highbush blueberry acreage has approximately doubled during the last decade and is still expanding. The industry is concentrated in the southeastern part of the state with 3500-4000 acres of which about 75 percent are producing. There are about 50 acres of rabbiteye blueberry (Vaccinum ashei) varieties, of recent North Carolina and Georgia origin, in Coastal and Piedmont North Carolina. Although the fruit of the rabbiteye varieties are now confined to local and home garden sales, it is believed that the fresh and processing potential of this species will be more extensively utilized in the future. "The rabbiteye species has a distinctive fruit quality, tremendous productive potential, a ripening season following the highbush, the advantage of minimal maintenance following establishment, and a broader tolerance to a variety of soils than the highbush species," Galetta says.

The major highbush varieties grown are Wolcott and Murphy. The acreage planted to varieties such as Berkeley, Bluecrop and Earliblue is limited because of their susceptibility to cane canker, except in the mountain area of North Carolina. Highbush blueberry varieties now being planted are mainly Wolcott, Murphy, Croatan, Morrow (a new variety), Jersey and Berkeley.

Galetta reports that the major problems of the industry are the labor shortage, the best economic pruning of bearing bushes, resurgence of a more virulent form of the stem canker fungus, the recent fruit set failure of the Wolcott variety and "uneven" propagation results.

Michigan

Jerome Hull, Jr., Extension Specialist in Horticulture, Michigan State University, East Lansing, Michigan, gives the following estimates of the highbush blueberry industry in Michigan.

The 1954 Michigan Agricultural census reported 4,160 acres of highbush blueberries and production of about 10 million pounds. The present blueberry acreage is about 9,000 acres with 7,000 to 8,000 acres of bearing age, and within the next several years an increase to 10,000 acres is anticipated. Blueberry production in 1964, was approximately 22 million pounds. In 1966, a yield of 22 million to 23 million pounds was anticipated. Generally, 60 percent of the production is processed and the remainder sold as fresh fruit.

Approximately 50 percent of the present acreage is planted to Jersey, but the popularity of this variety is declining because of unsatisfactory production--small seedless berries. Although the cause of these small seedless berries is not known, poor pollination is suspected. The Rubel variety is still popular in Michigan and accounts for 20 to 25 percent of the highbush acreage. The variety appears to be holding its own acreage-wise, because it appears to be ideally adapted to mechanical harvesting. Five to 10 percent of the present acreage is planted to Stanley, which has been popular for the early market season. This variety, along with Rancocas and Weymouth, is no longer being planted, however, as the popularity of Bluecrop has increased during the last few

years and now accounts for approximately 10 percent of the highbush blueberry acreage. More acreage of this variety would have been planted if more plants had been available.

Oregon

Mrs. Elvera Horrell, Extension Agricultural Economist, Oregon State University, Corvallis, Oregon, furnished the following data on the highbush blueberry industry in Oregon as reported in the U.S. Census of Agriculture, 1959 (General Report).

Oregon Blueberries

	1959	1954
Farms reporting	127	108
Acreage	693	130
Avg./farm	5.5	1.2
Quantity harvested, qts.	221,791	105,364
Avg./acre	320	810
Value, dollars	62,213	34,770
Avg./qt.	29	33

****

POMOLOGICAL PARAGRAPH

Tree Spacing - During the past 2 years, the writer has visited a number of apple orchards with close tree spacings, and has concluded that trees on E.M. VII spaced closer than 15 feet in the row will be difficult to manage as individual tree units. An exception may be spur-type Delicious, which due to their upright growth characteristic, might be spaced 12 feet apart.

Tree spacing between rows should be sufficient to allow room for use of bulk boxes while leaving space to drive past the boxes. Therefore, a good planting distance for most varieties on E.M. VII would appear to be 15' x 25'.

****

CHEMICAL WEED CONTROL IN STRAWBERRIES

Dominic A. Marini
Regional Agricultural Specialist - Southeast Region

Because of potentially high yields and strong demand, strawberries can be a profitable crop. Control of weeds is essential to the attainment of high yields, however, and since a strawberry bed occupies the land for about 16 months, a great deal of hand labor may be required to keep the bed weed-free. Because of the potential return, a greater investment in labor and other inputs can be justified with strawberries than with many other crops. However, where labor is not available, or where there is competition with other crops for labor, herbicides can be used to substantially reduce the high labor requirement of strawberries.

Until recently, a satisfactory herbicide for use on strawberries was not available. Now, 2 currently available materials, dacthal and diphenamid, when used properly and under the right conditions, can provide satisfactory weed control. Both herbicides must be applied to a weed-free soil, since they do not control established weeds. Furthermore, 1/2 to 1 inch of rain or irrigation is necessary following application for good weed control, since they must be washed into the soil to be effective.

Dacthal is recommended at the rate of 8 to 12 pounds of the 75 percent commercial product per acre. It remains effective for about 6 weeks, so several applications are required for season-long control. A late summer or early fall application provides good control of chickweed, a serious problem in most strawberry beds. Dacthal may be applied early in the spring, prior to weed germination to control weeds in bearing beds.

Dacthal is particularly effective against crabgrass and other annual grasses, and against purslane, chickweed and lambs quarter. It is weak against ragweed and red root pigweed, and poor against galinsoga, smartweed, mustard and other cruciferous weeds. Where galinsoga is a serious problem, use of dacthal is not recommended.

In some cases, injury has been observed where dacthal was applied, appearing as a puckering of certain leaves and somewhat resembling virus symptoms. It is not known whether or not this injury has any effect on runner formation or on the crop.

Diphenamid is recommended at the rate of 4 pounds active ingredient per acre---5 pounds of the 80 percent product or 8 pounds of the 50 percent product. It controls a wider range of weeds than dacthal and provides longer lasting control, but it may not be used within 12 months of harvest. This means that only one application may be made, soon after planting in April or May. Shallow cultivation improves its effectiveness. No injury has been observed following its use.

Recent investigations have shown that a combination of 2 herbicides frequently provide more effective weed control than either material used alone. In some cases the effect is additive, resulting in a wider range of weeds controlled; in other cases the combination controls certain hard-to-kill weeds not controlled by either material alone.

In one 1966 field trial, the combination of diphenamid and sesone (SES) gave the best results of 5 different treatments. Both materials were applied together in the same spray, diphenamid at the rate of 3 pounds of the 80 percent product per acre and sesone at 3 pounds per acre. In another trial, the combination of diphenamid and dacthal, each at 1/2 the recommended rate, gave the best results of 5 treatments. The combination of dacthal at the rate of 8 pounds per acre and sesone at 4 pounds per acre gave better control than dacthal alone.

On the basis of recent experience, it appears that the best choice for controlling weeds in strawberries at the present time is a combination of diphenamid with sesone or dacthal. The use of diphenamid is limited in that it may not be used within 12 months of harvest. The weed population on your farm would also have a bearing on your choice of herbicide. A little experimenting with these combinations on your farm is advisable, to see which performs best for you under your conditions.

****

RANDOM THOUGHTS ON CHEMICAL WEED CONTROL IN ORCHARDS

William J. Lord
Department of Plant and Soil Sciences

Chemical weed control is rapidly becoming a standard practice as a means of eliminating hand mowing and as an aid in the mouse control program. At present, most growers use a hand gun to apply herbicide sprays to a limited area around the base of each tree. However, a more reliable control of gallonage is obtained---and at a lower cost of application---if a tractor-mounted spray boom is used instead of a hand gun.

Effect on Tree Growth

Whether or not growth of young fruit trees would be improved by chemical weed control would depend upon existing cultural practices, growing conditions and perhaps by the nutritional status of the tree. Under good growing conditions, it is doubtful that chemical weed control would be superior to hay mulch for enhancing apple tree growth, or superior to mulch or cultivation in promoting peach tree growth. However, when young trees are growing in a well-established sod and rainfall is inadequate for optimum growth, chemical weed control may benefit growth.

Virtually complete elimination of weeds (grass as well as broadleaf weeds) may be desirable from the standpoint of mouse control, but it is questionable whether this degree of weed control would result in more terminal growth than when considerably less weed control was obtained.

Value of Chemical Weed Control

In the writer's opinion, there is no substitute for a hay mulch program in newly established apple orchards. Mulch will eliminate most weed competition and enhance the potassium and nitrogen levels in the trees. As the apple trees become older, however, few growers attempt to continue a mulching program other than mowing and letting the grass lie. A chemical weed control program would be of value in these situations to supplement the mouse control program. The treated areas under the trees serve as a barrier between the mouse and its potential food source ---the tree---and should provide some protection from mice during late fall and winter. With the advent of snow, however, this protection is lost. The snow will provide the necessary cover to allow mice to reach the tree, feed on it, and thus produce damage.

Recent Label Clearances

Recent label clearances now make it possible for growers to control a broader spectrum of weeds and to apply an herbicide whenever it is convenient. Because of timing restrictions on herbicide usage and tolerance to most herbicides; bindweed, poison ivy, dandelions and sorrel became problem weeds where chemical weed control was practiced. The labeling of Ammate X, Dacamine 4D and dichlobenil (Casoron) has helped solve these problems. Ammate X is available for the control of poison ivy in apple and pear orchards. Dacamine 4D, which has no restrictions on preharvest interval or frequency of use in apple and pear orchards, controls broadleaf weeds such as poison ivy, dandelions, sorrel, field bindweed and hedge bindweed. (These bindweeds are commonly called morning glory by growers.)

Growers wishing to rely on a fall weed program may use granular dichlobenil in apple, pear and peach orchards. This material will control a broad spectrum of perennial and annual weeds when applied during the late fall-early winter months. In our tests, dichlobenil has given outstanding control of sorrel, broadleaf plantain, buckhorn plantain and dandelions, which are tolerant to some herbicides. <u>However, this material should be used on a trial basis only, since further testing of rates of application and tree response to this herbicide is needed</u>.

Summary

If used properly, herbicides are a useful tool in orchards. The main benefits derived from their use are the elimination of hand mowing and the aiding of the mouse-control program. Because of label clearances, it is now possible to control a broader spectrum of weeds, prevent the influx of weeds tolerant to some herbicides, and to apply an herbicide whenever it is convenient.

****

PARAQUAT NOW LABELED FOR NON-BEARING FRUIT TREES

William J. Lord
Department of Plant and Soil Sciences

Paraquat is a liquid-formulation herbicide which kills both broadleaved and grassy weeds on contact. The chemical is translocated to some extent within both grass and broadleaf weeds but becomes inactive on contact with the soil. In other words, soil residue is not a problem with this material.

Paraquat acts as a chemical mower---burning succulent stems and foliage of the weeds with which it comes in contact. The effect of this burning action can be noted within several hours after application.

For best results, use 3 quarts of paraquat per sprayed acre in 100 gallons of water. When used with a recommended spreader, the amount of paraquat per acre may be reduced to 2 quarts. Apply paraquat in May when grass is 8-10" high. A repeat application will be necessary for season-long control, however. In following years, one annual application of paraquat may be sufficient.

Paraquat may be used under trees the year they are planted. This herbicide also would be useful if temporary burning to the ground cover were desired; for example, when conditions of drought exist.

Paraquat may be used with diuron or simazine. These mixtures will provide quick "knock-down" of weeds as well as a residue in the surface soil which may keep the treated area relatively free of weeds during the growing season.

Below are the recommendations as they will appear on the paraquat (ORTHO Paraquat) label. (Dealers presently hold some supplies of paraquat that do not bear this recommendation on the label.)

"NON-BEARING (Young Plantings) FRUIT CROPS AND WINDBREAK, SHADE AND ORNAMENTAL TREES: For control of annual broadleaf weeds and grasses and for top kill of perennial weeds and grasses in the interspaces and around the base of non-bearing (young plantings) fruit trees and vines such as Apples, Apricots, Citrus, Peaches and Grapes and other trees such as Arborvitae, Ash, Elm, Fir, Oak and Pine - Use 1.0 to 2.0 quarts of ORTHO Paraquat per sprayed acre in 50 to 200 gallons of water. Apply as a directed spray to thoroughly cover weeds and grasses. Add wetting agent, such as ORTHO X-77 Spreader, at 8 ounces per 100 gallons of spray. For best results apply when the weeds and grasses are succulent and growth is one to six inches high. Repeat applications as necessary to control newly germinated weeds and grasses and to control regrowth of perennials. CAUTION - Spray contact of succulent stems and foliage may result in injury from spot burning, desiccation and/or defoliation. Use coarse spray and avoid applications during windy conditions to avoid drift."

****

All pesticides mentioned in this publication are registered and cleared for the suggested uses in accordance with state and federal laws and regulations. Where trade names are used for identification, no product endorsement is implied nor is discrimination intended.

WARNING: MOST PESTICIDES ARE POISONOUS. READ AND FOLLOW ALL DIRECTIONS AND SAFETY PRECAUTIONS ON LABELS, HANDLE CAREFULLY AND STORE IN ORIGINAL CONTAINERS WITH COMPLETE LABELS, OUT OF REACH OF CHILDREN, PETS AND LIVESTOCK.

Cooperative Extension Service
University of Massachusetts
Amherst, Massachusetts
A. A. Spielman
Director of Extension
Cooperative Agricultural Extension Work
Acts of May 8 and June 30, 1914
—
Official Business
403 — 5/67 — 955
Permit No. 1216

Postage and Fees Paid
United States Department of Agriculture

FRUIT NOTES

Prepared by the Department of Plant and Soil Sciences
Cooperative Extension Service
College of Agriculture
University of Massachusetts, Amherst

EDITORS

W. J. LORD AND W. J. BRAMLAGE

JULY–AUGUST 1967

TABLE OF CONTENTS

Issued by the Cooperative Extension Service, A. A. Spielman, Dean and Director, in furtherance of the Acts of May 8 and June 30, 1914; University of Massachusetts, United States Department of Agriculture and County Extension Services cooperating.

APPLE ROOTSTOCK STUDIES

William J. Lord
Department of Plant and Soil Sciences

Recently, A. P. Preston, East Malling Research Station, Kent, England, published the results of 15 years' experience with apple trees on all the Malling-Merton (M.M.) clones and Malling (M.) XXV, and compared their performance with trees on older clonal rootstocks (The Journal of Horticultural Science 41 (No. 4):349-360, October, 1966). These trials showed that none of the trees on the new clones were as small as those on M.IX. Trees on M.M.106 and M.VII were similar to each other in size and cropping but unlike M.VII, M.M.106, was free from suckering. M.M.111 and M.II made trees of similar size, but Cox on M.M.111 yielded 20% more fruit than on M.II over the 15-year period of the trial; this was not solely an effect of earlier bearing for the difference in yield persisted through years 11 to 15. Trees on M.M.104 were larger than those on M.II and M.M.111 were heavy-bearing.

No large differences in fruit size between trees on different rootstock occurred and in some instances fruit size on the same rootstock varied greatly for different varieties and different soils. This indicates that rootstock is not one of the major factors affecting fruit size. Preston pointed out, however, that among the most fruitful rootstocks, trees on M.IX, M.VII, M.II, M.XXV, M.M.106 and M.M.111 all produced relatively large fruits. On the other hand, fruits from the heavy-yielding trees on M.M.104 were smaller than those from trees on M.IX. Fruit from trees on M.M.111 were not smaller than those from M.II, even though yields were higher on M.M.111.

Fruit color was recorded and showed only small differences between rootstocks.

(M.VII is the common size-controlling rootstock in our orchards at present. A few growers have trees on M.II, but most favor M.VII, because trees may be smaller on this rootstock. There is interest in M.M.106, since it is free of suckering and also it is reported that trees on this rootstock are better anchored than those on M.VII.----Editors)

****

POMOLOGICAL PARAGRAPH

Paying Apple Pickers by the Bucket. An apple harvest procedure new to the Extension Pomologist, but in use in Appalachia, is that of paying pickers by the bucket rather than by the bulk box. A picking crew which may consist of 10 to 12 men, empty full picking buckets into the same bulk box. A checker, who stands by the box, records the buckets harvested by each crew member and also examines the fruit for excessive physical damage. This harvest procedure has merit because the consolidation of the crew simplifies management.

RESEARCH IN OTHER AREAS
NEW OVERWRAPPED TRAYS FOR MCINTOSH APPLES

William J. Bramlage
Department of Plant and Soil Sciences

McIntosh apples are very easily bruised, and it is not uncommon to find packages of badly bruised fruit on the market shelf. A package that will protect the fruit from rough or careless handling is badly needed for this variety.

In a recent study, a new molded-pulp, high-post tray with a polyvinyl-chloride shrink-film overwrap was evaluated against conventional 3-pound polyethylene bags and 6-fruit trays with shrink-film overwraps by R. T. Hinsch of the U.S. Department of Agriculture.

McIntosh apples were packed in commercial packing houses in Michigan and truck shipments were made to Cleveland and distributed to several retail food stores. Examination in these stores showed that 7% of the apples in the high-post trays were bruised, in contrast with 78% in the polyethylene bags and 50% in the trays. Furthermore, none of the apples in the high-post trays had serious bruises, while 25% of those in polyethylene bags and 3% of those in trays were seriously bruised.

The cost of the packaging materials and direct labor per pound of apples was 1.6 cents for the polyethylene bag, 3 cents for the high-post tray, and 3.3 cents for the 6-fruit tray.

These data are found in the publication ARS 52-16, "New Overwrapped Trays for McIntosh Apples," available from the Office of Information, USDA, Washington, D.C. 20250.

****

A NEW PUBLICATION AVAILABLE

Watercore, a non-parasitic disorder of apples, is a problem of yearly concern to growers in New England. Its presence has a two-fold effect on fruit quality; not only does it affect appearance and flavor of the apple, but it also frequently leads to internal breakdown following harvest. U.S. Apple Standards require that U.S. No. 1 or U.S. Fancy fruit be free of watercore damage after January 31, and when 3 or more vascular-bundle areas are affected with watercore, the apple is considered to be damaged. For U.S. Extra Fancy, no trace of watercore is allowed after January 31. A grower thus may incur substantial losses from watercore through both downgrading of sound fruit and development of internal breakdown.

Therefore, a publication entitled "Watercore and Internal Breakdown in Delicious Apples" has been prepared by W.J. Bramlage and W.J. Lord to

acquaint growers with what is known about watercore and what might be done to reduce losses resulting from it. This publication is available from your County Extension Service or from William J. Lord, French Hall, University of Massachusetts, Amherst 01002.

****

COOLING APPLES IN BULK BOXES

William J. Lord
Department of Plant and Soil Sciences

Rapid cooling of fruit in storage is an extremely important phase of cold storage management. Cooling of apples from field temperature to 32^{o}F within 2 or 3 days instead of 4 to 6 weeks can make a great deal of difference in the keepability of apples. With the adoption of bulk boxes by the apple industry, the cooling of fruit in these large containers becomes a problem of extreme importance if optimum storage life is to be obtained.

Research by G. O. Patchen and G. F. Sainsbury (USDA Marketing Research Report No. 532, 1962) has shown that a bulk box constructed with either the sides or bottom having approximately 8 to 11 percent free area (air space between boards) will provide cooling characteristics as good as those of standard field crates on pallets. Free air space on the sides gave cooling results comparable with free air space on the bottom of the bulk boxes.

Previous studies by Sainsbury showed that when containers of fruit are placed directly in contact with outside walls, heat is transmitted through conduction that affects the temperature of the fruit. The fruit temperature may be 1^{o} or 2^{o}F higher or lower, than fruit in adjoining bulk boxes, depending on whether outside temperatures are higher or lower than those inside. To prevent this from occurring, the bulk boxes should be stacked at least 6 inches from outside walls. Similar space is needed near the inside walls to insure adequate air circulation past and through the stacked boxes.

The rows of stacked boxes should be parallel to the flow of air from the diffuser or duct openings. With two-way-entry pallets, a row of boxes constitutes an almost solid barrier to the flow of air, and placing the stacks perpendicular to the flow of air impedes air movement. More uniform holding temperatures are obtained when stack rows are parallel to air flow.

Stack rows should be made up of bulk boxes of similar size, so that the fork space of the pallets is continuous from front to back of the row, allowing a continuous air channel. Although the bulk boxes may be nearly similar in height, any difference is cumulative. A 1-inch difference in height in each layer can blank off the channels at the top of the stack.

Patchen and Sainsbury had the following comments about the importance of air circulation:

"Air circulation appeared to play the greatest part in the cooling rate of the apples stored in pallet boxes.

When the cooling air units are overhead in the center of a storage, the air circulates over the top of the fruit and out to the side walls; then downwards and back through stack row channels and pallet fork spaces. The volume of air moving in the channels and pallet fork spaces is less near the bottom of the stack than near the top. This causes a small rise in temperature of the cooling air as it passes by successive stacks (especially when the fruit is warm) in the rows. Therefore, the last pallet boxes passed by the air, cool more slowly than the first pallet boxes that are in contact with the colder air.

When thermocouples were placed in apples at the outer edge, at bottom, top, and middle positions, and in the air at the center of the pallet box, the sides and bottom were found to cool the fastest. The air temperature beside the center apple was always slightly colder than the adjoining apple. Warm air rises, and as the air was warmer for most of the test at the top of the pallet box, this indicated a circulation of air through the apples. This shows the necessity of having air circulating above the pallet box to remove this warm air. The apples at the top of the pallet box remained slightly warmer than the apples at the center of the pallet box until near the stabilizing temperature, at which time they were approximately the same.

The apples at the bottom and sides of the pallet box cooled very rapidly and stayed from 1^{o} to 3^{o} cooler than the center apple, until near the stabilized temperature. The widest variation occurred near the beginning of the test.

From the data obtained in these tests, the cooling-rate variation for apples of different size could not be determined, if any existed. The variation of air circulation and location of the pallet box in the stack had the largest effect upon the cooling rate."

****

NEW ENGLAND FRUIT TREE SURVEY-1965

W. D. Weeks
Department of Plant and Soil Sciences

The following tables were constructed from the data which appeared in the recent publication of the New England Crop Reporting Service.

In Table 1, the number of apple trees by age groups and the percent of the total number of trees in each age group for each New England state are presented.

Table 1. Number and percent of total apple trees by age groups for each state in New England.

	1 to 6 Years		7 to 11 Years		12 to 21 Years		22+ Years		Total
	No.	%	No.	%	No.	%	No.	%	
Maine	56,080	23.3	30,483	12.7	53,370	22.0	100,857	42.0	240,790
N. H.	52,523	31.1	20,021	11.9	26,411	15.7	69,707	41.3	168,662
Vt.	56,500	35.1	17,970	11.1	12,848	8.0	73,890	45.8	161,208
Mass.	64,220	20.4	33,431	10.6	56,671	18.0	160,930	51.0	315,252
R. I.	3,553	15.2	1,102	4.7	2,654	11.4	16,058	68.7	23,337
Conn.	30,822	21.9	21,052	14.9	25,405	18.0	63,776	45.2	141,055

Massachusetts leads in the total number of trees in all age groups, while Rhode Island has the smallest number of trees in each age group. A comparison of the percent of trees by age groups in relation to the total tree numbers shows that for the 1 to 6 year age group Vermont and New Hampshire lead with 35.1 and 31.1 percent followed by Maine with 23.3 percent, Connecticut 21.9 percent, Massachusetts 20.4 percent, with Rhode Island last with 15.2 percent. These data show that based on the size of their industry Vermont and New Hampshire have been planting more trees, while Massachusetts and Rhode Island have been planting fewer trees than their neighbors.

Rhode Island and Massachusetts have a larger proportion of their trees in the older age group with 68.7 and 51.0 percent in the 22 year and older group. New Hampshire and Maine have 41.3 and 42.0 percent of their trees in this age group. Connecticut and Vermont have 45.2 and 45.8 percent of their trees in the old tree group.

Table 2 shows the number and percent of apple trees in New England by states and age groups.

Maine has 22.9 percent of the total trees in New England with 21.3 percent of the trees under 7 years and 22.3 percent of the trees under 12 years. New Hampshire has 16.1 percent of the total trees, but it has 19.9 percent of the trees under 7 years and 18.7 percent of the trees under 12 years. Vermont with only 15.3 percent of the total trees has 21.4 percent under 7 years and 19.2 percent under 12 years. Massachusetts has 30.1 percent of the total trees with 24.4 percent of the trees under 7 years and 25.2 percent under 12 years. Rhode Island has only 2.2 percent of New England's tree population. It has 1.3 percent of the trees under 7 years and 1.2 percent under 12 years. Connecticut has 11.7 percent of the trees under 7 years and 13.4 percent under 12 years. It has 13.4 percent of the total tree numbers in New England.

Table 2. Number and percent of apple trees in New England by states and age groups.

	Trees Under 7 Years		Trees Under 12 Years			
	No.	% N.E.	No.	% N.E.	Total	% N.E.
Maine	56,080	21.3	86,564	22.3	240,790	22.9
N. H.	52,523	19.9	72,544	18.7	168,662	16.1
Vt.	56,500	21.4	74,470	19.2	161,208	15.3
Mass.	64,220	24.4	97,651	25.2	315,252	30.1
R. I.	3,553	1.3	4,655	1.2	23,337	2.2
Conn.	30,822	11.7	51,874	13.4	141,055	13.4

Since future production of an apple producing district is dependent upon the numbers of young trees in relation to the total tree population, it should be possible from the data in the two tables to project the future of the apple industry in the different New England states.

On the basis of young trees under 12 years, it would appear that Vermont and New Hampshire can expect an increase in production. Massachusetts and Rhode Island might expect a decrease, since their percent of young trees shows a decrease in relation to their total tree population. Maine and Connecticut should expect to maintain their current production, since their percent of young trees is equal to the percent of total tree population.

Massachusetts will still remain the leading producer of apples in New England for sometime because of its greater total tree numbers. However, it appears that a gradual shift in production to the three northern states will take place in the future.

****

Pomological Paragraphs

Growth in CA Storage Holdings. In 1956, the Division of Markets, Massachusetts Department of Agriculture, began listing CA storage holdings in its Special Apple Market Report. The increase in CA holdings since 1956 is of interest, and is shown in the table below.

Since 1963, approximately half of the McIntosh crop in storage on November 1, has been CA. During this same period, CA has accounted for

40% or more of the total apple crop in storage. As a point of interest, in 1961, we had the largest stored apple crop on record.

Apple-storage holdings (thousands of bushels) in Massachusetts on November 1, of the years 1956 to 1966.

	McIntosh			All Varieties		
Year	Regular storage	CA storage	Pct. stored crop in CA	Regular storage	CA storage	Pct. stored crop in CA
1956	730	118	13.9	1,232	118	8.7
1957	1,362	181	11.7	1,951	194	9.0
1958	1,012	397	28.2	1,594	442	21.7
1959	1,023	437	29.9	1,630	471	22.4
1960	646	473	42.3	1,162	486	29.5
1961	1,208	585	32.6	1,791	634	26.1
1962	929	610	39.6	1,483	698	32.0
1963	661	655	49.8	1,108	746	40.2
1964	602	667	52.6	1,019	788	43.6
1965	670	699	51.1	1,128	793	41.3
1966	412	552	57.3	771	679	46.8

Polyethylene Envelopes for Pallets. Polyethylene box liners are in common use as a means of extending the storage life of Golden Delicious apples. Growers who palletize field boxes should consider the use of a polyethylene envelope over the entire pallet rather than using polyethylene liners in each box.

Publications Available. The publications listed below are available from your County Extension Service or from William J. Lord, French Hall, University of Massachusetts, Amherst 01002.

1. Apple Sorters' Manual - Extension Publ. No. 10, Revised June, 1967. All growers and packers should obtain copies of this publication in which is incorporated the changes in the United States Standards for Grades of Apples that became effective September 1, 1964.

2. Be a Better Apple Picker - Special Circular 246, Reprinted April, 1966.

3. The Economics of Handling Apples in Bulk Boxes - Extension Publication No. 9, April, 1967.

4. Scald Control for Apples - Special Circular No. 277, Revised, August, 1967.

5. Preharvest Drop Control of Apples - Special Circular No. 254, Reprinted, 1966.

****

Cooperative Extension Service
University of Massachusetts
Amherst, Massachusetts
A. A. Spielman
Director
Cooperative Agricultural Extension Work
Acts of May 8 and June 30, 1914
—
Official Business
411 — 7/67 — 980
Permit No. 1216

Postage and Fees Paid
United States Department of Agriculture

FRUIT NOTES

Prepared by the Department of Plant and Soil Sciences
Cooperative Extension Service
College of Agriculture
University of Massachusetts, Amherst

EDITORS

W. J. LORD AND W. J. BRAMLAGE

OCTOBER 15, 1967

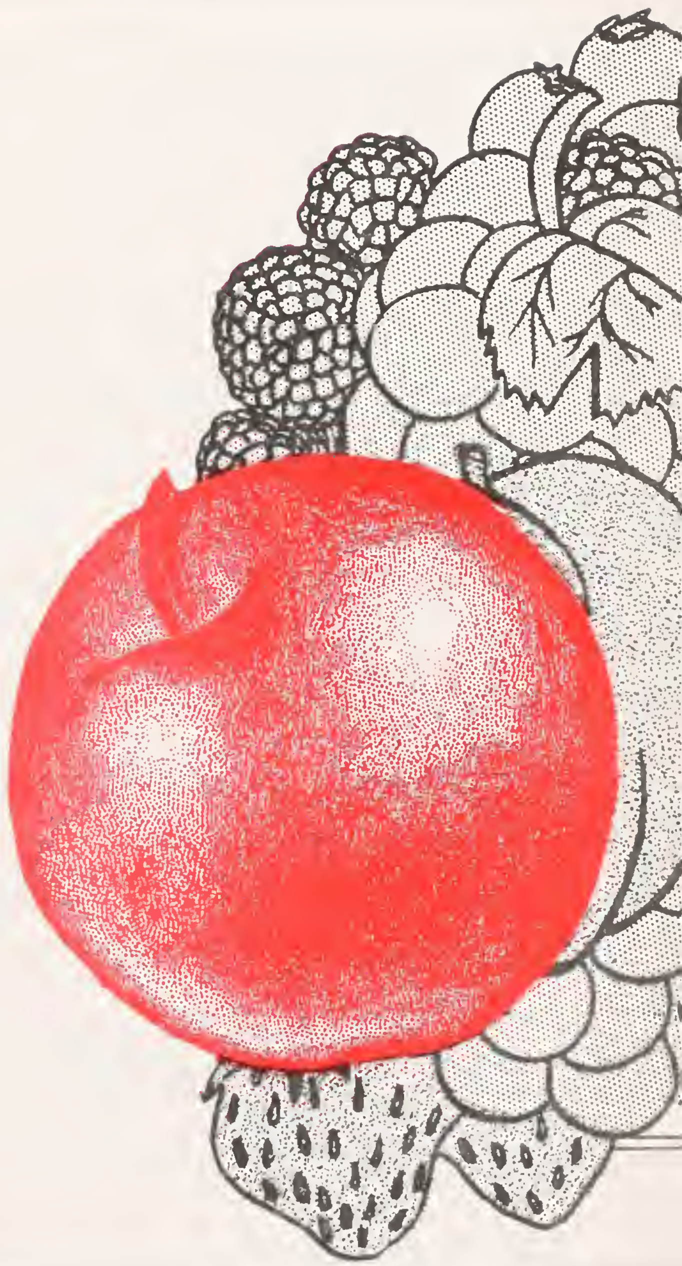


TABLE OF CONTENTS

Issued by the Cooperative Extension Service, A. A. Spielman, Dean and Director, in furtherance of the Acts of May 8 and June 30, 1914; University of Massachusetts, United States Department of Agriculture and County Extension Services cooperating.

HEADLINES Like These HURT !

Ellsworth H. Wheeler
Professor of Entomology
Leader, Pesticide Chemicals Program

Herbicide Product Found On Bank of Reservoir

[redacted] — The [redacted] story has not ended, contrary to some reports.

Moderate Toxicity

Empty bags of atrazcne, a herbicide of moderate toxicity, have been found in a corn field adjacent t o the [redacted] Reservoir by officer

Could things done in YOUR operations result in this kind of news?

Or could YOU be the cause of an even greater tragedy? A child perhaps? Not all pesticides have "Moderate Toxicity"!

A field, ditch, stream bank or an open dump anywhere is NOT a safe place to leave "empty" pesticide containers. They are never empty!

Burn"empties", that will burn (except hormone-type, 2,4-D, etc., weed killers) in a spot where ashes can be buried; this amount of heat does not destroy pesticides. And remember, smoke from organo phosphate insecticides is especially dangerous.

Bury bottles and metal containers at least 18 inches down, deeper if possible, at a spot where, in so far as possible, you have determined there is no chance of later exposure or that waters can be polluted. Break bottles and puncture and/or crush cans and drums, but do it in the hole or so that surface soil is not contaminated. Avoid splashing with the concentrates!

* * * * * * * * * *

Remember! Accidents with pesticides don't just happen - - somebody lets them happen - - someone who failed to carry out his full responsibility.

****

LET'S PROMOTE "McINTOSH COUNTRY"

Ralph Baldasaro
New York and New England Apple Institute

(Talk presented at the Annual Summer Meeting of the Mass. Fruit Growers' Assoc., July 12, 1967, at the Horticultural Research Center, Belchertown, Massachusetts)

A year ago this week, I sat on one of the chairs you are now occupying. I listened to a number of learned men discuss apple growing and research being conducted to improve the crop. Today, I stand before you as one of the speakers. But, I don't pretend to know anything about growing apples! Since joining the New York and New England Apple Institute last July, I have almost avoided the technical aspects of the apple; I can't tell scab from scald or rust from rot and maybe that is for the best. My time has been spent in the market place, the place in my opinion that needs more of your attention, more research and more of your learned help.

You will admit that growing is no longer the great problem it was and as production problems arise they are recognized and solved by capable people in the Land Grant Colleges. But, selling is and always has been a problem, and as our customers become more urbanized, this problem will become even more complicated.

The first step toward the solution to any problem is its recognition. You, as apple growers, have recognized the problem of marketing. Some on purpose, some by accident, some with enthusiasm, and some with desperation---but you <u>have</u> recognized that there is no profit until you sell the wonderful product you have grown---a crisp McIntosh.

If you could manufacture a real good "hoop-de-la" and be the only "hoop-de-la" manufacturer in the country, your sales and profits would be guaranteed---that is, until Uncle Sam declared you were a monopoly. However, we are not a monopoly; other areas grow apples, including McIntosh apples. But nowhere, no one, regardless of know-how, grows McIntosh apples as well as you do in New England and Eastern New York State. And no one grows as many of these fine McIntosh. Eastern New York and New England produces 76% of the nation's McIntosh crop, and 65% of our own total apple crop is McIntosh. So we can rightfully say, "This is McIntosh Country."

Are these only figures and percentages that really don't affect YOU? Does it make any difference to you what variety of apples your neighbor grows? Yes, it does make a difference to YOU---in expenses, sales and ultimately in profits. Advertising and marketing expenses are substantially reduced mainly because we produce so many good McIntosh apples.

Your institute has for many years concentrated the majority of the consumer advertising budget on McIntosh. You have seen it, and more importantly, the customer has seen it, telling him "Macs are back," "Shine up your life with a Mac," and other equally good advice. Promotion of McIntosh has been the major emphasis of all our sales aids and point-of-purchase materials, employing the same themes as our radio, newspaper and TV advertising. And this, promotion has been effective. Without McIntosh, representing such a large percentage of your production, we would have to spread our advertising budget over several varieties. The result would have been catastrophic. We believe we need more money for advertising McIntosh now. However, only Divinity could guide a successful advertising and marketing program if we were forced to advertise several varieties of equal production with our present resources.

If you are a student of advertising, serious or casual, you are surely aware of how strongly companies try to put their brand name before the public. Trade-mark acceptance is, in the considered opinion of the largest companies, their key to greater sales. It keeps their present products selling at a good profit, allows introduction of new and allied products with built-in consumer acceptance and provides an image for their total marketing program.

The New York and New England Apple Institute embarked on a course of trade-mark advertising back in 1961 with the introduction of "Crisp-aire" to identify controlled atmosphere apples. This has been widely accepted by the trade and consumer alike and has provided that "umbrella image" which makes your individual orchard brand more important. In fact, consumers in many instances refer to Crisp-aire as a new variety of apples that is available in the early spring. Certainly a misconception of the original idea, but no one can deny the importance of the image created by Crisp-sire.

Now, what do we do about the remaining percentage of our apple crop that is marketed outside of the Crisp-aire period. We have tried within the means of our budget, to identify "Apples from New York Orchards" or "Apples from New England Orchards" with the Institute name on all our ads. This is really not enough. The picture is bigger than that. The picture is that Eastern New York and New England are the largest producing areas for McIntosh in the country to the tune of 76% of the total nationwide crop of McIntosh. We should be striving to weld these 2 areas into a unified entity and present this idea to the trade and consumers in an exciting fashion.

The most logical course to follow in view of our McIntosh production is to identify the area as "McIntosh Country." After all, if we don't promote McIntosh, no other segment of our industry will. It is not important to other geographic areas and we are glad of it. It makes our area more important because nowhere, nohow, can anyone grow the apples we do in "McIntosh Country."

This year we are out to get a bigger share of the apple market because this year we think we will have a bigger crop.

This year we think we can go further under the banner of "This is McIntosh Country."

This year we have something new for retail stores, and we intend to see most of them.

This year we have new advertising.

This year we have a premium offer.

So, help us to help you. The next time someone asks you where you are from, tell them---Mister---"I'm from McIntosh Country." You'll be surprised how many consumers recognize you.

****

DISTRIBUTION OF <u>PURE</u> STRYCHNINE AND <u>PURE</u> ZINC PHOSPHIDE TO BE DISCONTINUED

Edward R. Ladd, Wildlife Biologist
U.S. Fish and Wildlife Service
Univ. of Mass., Old Conservation Bldg.
Amherst, Massachusetts 01003

The Bureau of Sport Fisheries and Wildlife recently announced its discontinuance of the sale of Pure Zinc Phosphide and Pure Strychnine Alkaloid Powder. This in no way affects the availability of the Zinc Phosphide Rodenticide and Zinc Phosphide-treated Steamed-crushed oats recommended for the control of orchard mice or the Strychnine-treated Steamed-crushed oats recommended for the control of mice in apple storages. As in the past, these materials will still be available through farmer cooperatives and the Wildlife Services Fund Office, University of Massachusetts, Old Conservation Building, Amherst, Massachusetts.

****

CONTROL OF ORCHARD MICE

Edward R. Ladd, Wildlife Biologist
U.S. Fish and Wildlife Service
Univ. of Mass., Old Conservation Bldg.
Amherst, Massachusetts 01003

The winter months are the time of year when orchardists can expect mouse damage to fruit trees unless precautions are taken

to prevent this. Most fruit growers know from past experience which areas and blocks of trees are most subject to girdling. It is still a good idea, however, to make a fall survey of the orchard to determine whether new trouble spots have developed. Any areas having many mouse trails, chewed apples or the characteristic fan-shaped mounds of soil pushed up by pine mice, have potential mouse damage problems. These are the areas where a thorough mouse control program should be undertaken.

MEADOW MICE

These are the surface-living mice most common to orchards in New England. Their injury to fruit trees is bark chewing from the root collar up. Control of these mice can be in two parts, each complementing the other. Since these animals like all others require food and shelter for survival, some protection can be gained by the alteration of these two necessities. Close mowing of grass and weeds in the orchard should be done periodically throughout the year, but especially in the fall when mouse populations are the highest. Removal of this mouse cover can best be done with a rotary mower. These machines do not leave a layer of mowed vegetation covering the orchard floor. The material is chopped fine and dispersed, leaving the area open and exposed, a situation mice avoid.

Perhaps a more effective way of curbing vegetation in the orchard is by the use of herbicides. When used properly, herbicides will create a barren area around trees. These open areas are avoided by meadow mice. The larger the cleared area, the more protection that can be expected.

Control of vegetation should not be used as the primary method in meadow mouse control, only as a supplement to the use of toxic baits designed for mouse control. Also, remember that during the winter deep snow will provide the needed cover for mice and they will be able to reach the trees without becoming exposed.

The use of Zinc Phosphide-treated steamed-crused oats is still the best method for controlling orchard mice. These treated oats may be applied either by the Trail Builder Machine or by broadcasting, using 6-10 pounds per acre. All sections of the orchard having meadow mice should be treated in the fall. For extra protection a buffer strip around each block of trees should be baited. This additionally-treated area will provide a greater distance that migrating mice have to cover before reaching the orchard. For those areas having an overabundance of mice, an extra treatment may be needed if the initial one did not give adequate control. Hand placement or broadcast of Zinc Phosphide Rodenticide-treated apples is a good follow-up method.

Periodic checks during the winter months, particularly after a thaw, may reveal spots still having meadow mouse infestations. A tablespoonful of Zinc Phosphide-treated steam-crushed oats poured into the holes may give added protection for the remaining winter months.

PINE MICE

Pine Mice are the underground species found in many New England orchards. Damage caused by these animals is primarily the girdling of root systems of apple trees. This form of injury is not readily apparent until the tree loses its vigor, the leaves take on a yellowish cast, or suckers sprout from the damaged roots.

Control of pine mice is more difficult and seldom as effecteve as for meadow mice. The broadcast method of poisoned baits recommended for mouse control may get a few pine mice but usually not enough for adequate protection. Also, it should be noted that control of vegetation may not have any effect on pine mouse numbers because of their living habits.

To obtain good control, it means that Zinc Phosphide-treated baits must be placed where the animal spends most of its time--in underground trails. If the infested area is small, hand baiting of the pine mouse natural runways using treated oats or apple cubes is effective. The larger the number of runs per tree that are treated, the better the control will be.

For larger areas, the use of the Trail Builder machine in proper adjustment, is an advantage. By making artificial trails on 2 or 4 sides of each tree, a great number of the pine mouse natural runs are intersected. Most of the commercially-available Trail Builder machines have automatic dispensers which will put out 35-45 bait placements, when all 4 sides of a tree are treated.

Whether an orchardist hand baits for pine mice or uses a machine, there is one absolute necessity: <u>the artificial trail and the natural runs must be kept as clean as possible</u>. Pine mice maintain clean, well-packed trails. All foreign matter and debris, especially soil, are removed by the mice. In doing this, the mice quite often will cover or carry out the treated bait with the other materials. This can reduce considerably the amount of control to be attained.

****

RABBIT CONTROL IN CULTIVATED BLUEBERRIES

Edward R. Ladd, Wildlife Biologist
U.S. Fish and Wildlife Service
Univ. of Mass., Old Conservation Bldg.
Amherst, Massachusetts 01003

With the large numbers of rabbits that have been seen during the summer months, it is logical to expect more than the average amount of rabbit damage to cultivated blueberries during the winter.

Basic control of rabbit damage should begin in the late summer or early fall, before snow falls and before the natural food supply of rabbits becomes scarce. Mainly, this means the removal of rabbit cover in and around the blueberry plantation. Brush piles, brushy stumps, overgrown ditch banks, and hedgerows all supply cover needed for rabbit survival. Removal of this cover deprives the rabbit of natural hiding places and forces some to move elsewhere. If a history of rabbit damage in the blueberry plantation is known, vegetation control should be considered as a supplement to other rabbit control methods.

One method of preventing rabbit damage is by the use of repellents. The purpose of these materials is to make the tree or shrub distasteful to rabbits, thus forcing them to seek other plants for food. All stems, limbs, and twigs should be coated with the repellent to a height that rabbits might reach during a period of heavy snow cover. Some of the available repellents are mentioned below.

Thiram (ARASAN 42-S*) is a repellent for the protection of fruit trees, ornamentals, and nursery stock. This material is available in the New England states through local distributors of farm supplies. Manufacturer's recommendations for mixing and application should be followed. For longer protection under severe weather conditions, a sticker such as RHOPLEX AC-33* or LATEX 512-R* should be added to the repellent solution.

Z.I.P.* is a ready-to-use concentrate with a "Z.A.C.*" base repellent. This material also is available in the New England states through distributors of farm supplies. The manufacturer's recommendations for mixing and application should be followed. The sticker is included in the prepared mix.

Other prepared repellents which can be used for protecting fruit trees and shrubs against rabbit damage are: TAT-GO*; NIBONEX NO-NIB'L RABBIT REPELLENT*; MAGIC CIRCLE RABBIT REPELLENT*. TAT-GO* and MAGIC CIRCLE RABBIT REPELLENT* are not registered for sale in Massachusetts, however. Distribution of these products is limited in the New England area and orders for the repellents registered in your state may have to be placed directly with the manufacturers.

If the blueberry plantation is not too large, fencing may be used to keep out the rabbits. A fence of 1½-inch mesh and high enough to extend two feet above the high snow mark should keep the animals out of the area. CAUTION must be taken to make certain that no rabbits are trapped inside the fenced area for one animal can do extensive damage because no other food will be available except the blueberry bushes.

*Trade names

Further information on rabbit repellents, as well as live trapping and fencing of rabbits, may be obtained by writing to the office of the U.S. Fish and Wildlife Service at Amherst, Massachusetts.

(Note: Mention of the foregoing products in no way implies their endorsement by the U.S. Fish and Wildlife Service.)

****

HARVESTING AND STORING PEARS

W.J. Bramlage and J.F. Anderson
Department of Plant and Soil Sciences

Most pears grown in New England are marketed locally by the grower, which means that high quality is necessary for repeat sales at the roadside stand or retail store. Pears can be a very high quality commodity, but producing this quality requires special care. The fruit must be harvested at the right stage, stored correctly, and ripened properly to produce this premium quality.

Unlike most fruits, pears cannot be tree-ripened, because they will develop internal breakdown. They must be harvested green, but at a rather definite stage of maturity. This maturity is best determined by flesh firmness, and it has been repeatedly found that the Magness-Taylor pressure tester is an adequate tool for this determination. This is in marked contrast with apples, where the pressure tester has very limited value as a maturity index.

In determining pear maturity, the Magness-Taylor pressure tester is used the same way as on apples, with one very important exception: a 5/16" diameter head must be used instead of the 7/16" head used for apples. Since the green pears are much harder than apples, the smaller head is essential to get a meaningful reading. Using the 5/16" head, the following pressure-test ranges have been established as indices of optimum maturity for major varieties: Bartlett, 20-17 pounds; Bosc, 15-12 pounds; Anjou, 15-13 pounds; Comice, 13-11 pounds; Gorham and Flemish, 14-12 pounds.

It is important that pears be harvested at the proper stage of maturity. Fruit picked too early tends to shrivel in storage and to develop poor quality when ripened, while over-maturity results in shortened storage life and the development of breakdown disorders. Susceptibility to certain physiological disorders, especially CO_2 injury, is associated with advanced maturity.

All varieties of pears can be stored safely at the lowest temperature at which they will not freeze, which ranges from 27° to 29°F.

Therefore, in a storage with a good temperature-control system, pears should be stored at 30°F for maximum storage life. Storage at 30° rather than 32-34° will lengthen storage life significantly.

Since pears are quite prone to shriveling, especially at the narrow stem-end of the fruit, humidity control is particularly important. Maintaining the storage at 90-95% R.H. is considered to be optimum. However, packing the pears in perforated polyethylene bags is an excellent way to control shriveling due to moisture loss.

The Anjou variety of pears is very susceptible to scald. In the Pacific Northwest, it has been found that dipping the fruit in 2700 ppm ethoxyquin (Stopscald*) will provide adequate control of this disorder, and a fungicide is commonly applied with the Stopscald* will provide adequate control of this disorder, and a fungicide is commonly applied with the Stopscald to reduce decay during storage.

Pears have been shown to respond well to CA, although the commercial adoption of this storage method has been much less than for apples. It has been found in the West that the best atmosphere for Barlett and Anjou is 3% O_2 and 1% CO_2; the low CO_2 level is necessary since pears are very sensitive to this gas, which causes browncore to develop. Experiments are now being conducted in New York to determine the best CA conditions for Eastern-grown pears, and it is anticipated that CA storage will become a significant factor in pear storage in the near future.

Varieties differ in their storage life, and this inherent difference is accentuated by the harvest maturity and the storage conditions to which they are subjected. In general, however, Bartletts seldom keep well beyond December-January, Boscs beyond February, or Anjous beyond March. Pears may lose their capacity to ripen properly with too-long storage, and this terminal point of storage is usually shown by light yellowing of the skin of pears in the storage room.

Perhaps the greatest deterrent to prime quality is improper ripening of pears. Most pears do not ripen in storage, thus must be ripened after storage. All that is needed to achieve peak quality is to hold them at 60-65°F until sufficiently soft and yellow, yet only too often they never attain this peak. Proper ripening is the culmination of all the grower's efforts to provide the consumer with a high quality item. If the pears are not ripened or are ripened at too high or too low a temperature, not only is the consumer being robbed of quality, the grower is being robbed of the satisfaction, reputation, and repeat sales that could have been generated by that lost quality.

*Trade name

****

FEWER FLIES MEAN MORE CUSTOMERS

Ellsworth H. Wheeler
Professor of Entomology
Leader, Pesticide Chemicals Program

Flies in and around your roadside stand or farm salesroom can hurt your business. There are ways to reduce their numbers. Such procedures should be a regular part of Good Management.

Common house flies are attracted to moist, decaying organic material such as fruit and vegetable refuse and manures. The tiny fruit flies go for fermenting plant juices, while green and blue "bottles" prefer meat, garbage and dog stools. All these flies travel amazing distances, but a large population means they are breeding nearby! The first step in controlling them is obvious.

1. Clean up and keep it clean! A refuse pile out back means flies out front and inside. Do it every day. Nothing can take the place of sanitation!

2. Apply residual sprays on surfaces where flies rest; do not contaminate foods. Repeat as necessary.

   All around the outside, use dimethoate (Cygon*) or ronnel (Korlan*) or Diazinon* emulsible concentrate, diluted with water as directed on labels.

   Use ronnel on inside surfaces that can be treated without danger of food contamination.

3. Employ space treatments to kill flies inside at closing time and when convenient or necessary at other times.

   Use aerosols containing either pyrethrins or DDVP (Vapona*). Follow directions to avoid food contamination.

   If ventilation can be controlled or if it is not excessive, the yellow resin strips from which DDVP (Vapona*) vapor is volatilized at a constant rate may prove useful. Don't expect results if directions are not followed as to ventilation and number of strips per unit of space.

4. Other suggestions to help control flies: air currents created by fans; fly baits, used as directed; yellow Bug-lite* bulbs; Geigy Snip Bands* hung as directed.

(Note: Where trade names are used for identification, no product endorsement is implied nor is discrimination intended.)

*Trade name

****

WARNING: Most pesticides are poisonous. Read and follow all directions and safety precautions on labels. Handle carefully and store in original containers with complete labels out of reach of children, pets and livestock. Dispose of "Empty" Containers Right Away in a Safe Manner and Place. Do not Contaminate Water, Foods or Feed.

Cooperative Extension Service
University of Massachusetts
Amherst. Massachusetts
A. A. Spielman
Director
Cooperative Agricultural Extension Work
Acts of May 8 and June 30, 1914

Official Business
415 10 67 — 969
Permit No. 1216

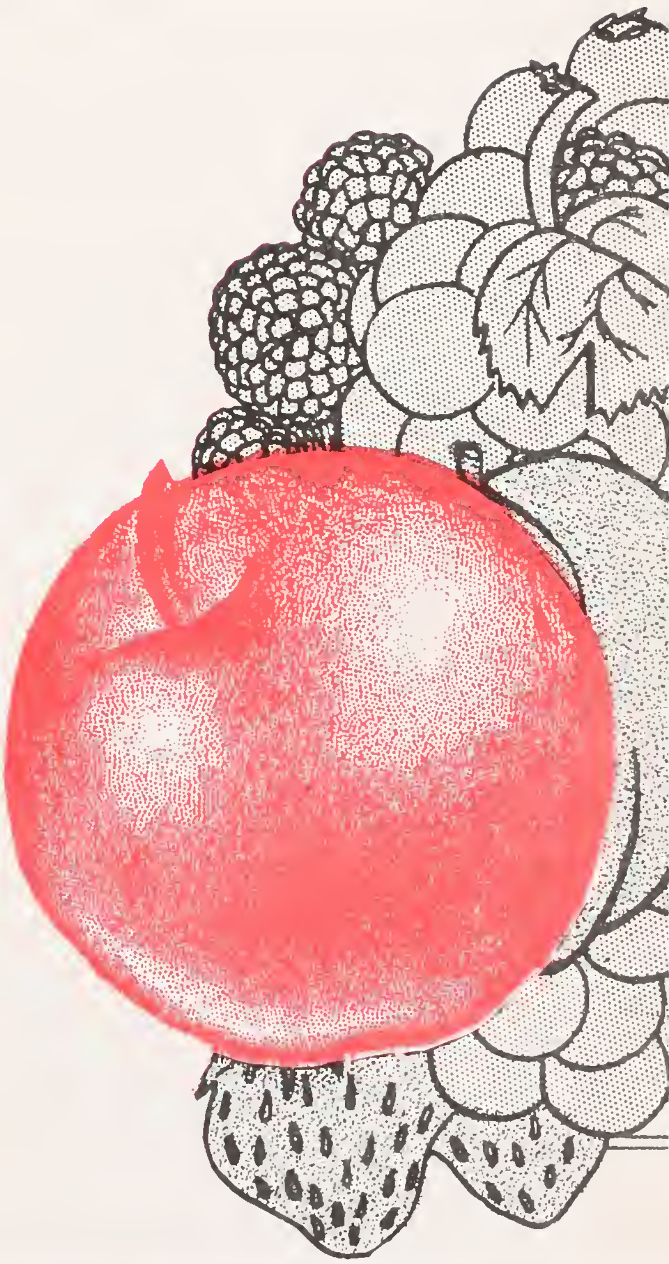
Postage and Fees Paid
United States Department of Agriculture

FRUIT NOTES

Prepared by the Department of Plant and Soil Sciences
Cooperative Extension Service
College of Agriculture
University of Massachusetts, Amherst

EDITORS

W. J. LORD AND W. J. BRAMLAGE



NOVEMBER–DECEMBER, 1967

TABLE OF CONTENTS

Issued by the Cooperative Extension Service, A. A. Spielman, Dean and Director, in furtherance of the Acts of May 8 and June 30, 1914; University of Massachusetts, United States Department of Agriculture and County Extension Services cooperating.

NEW ENGLAND FRUIT MEETINGS AND TRADE SHOW

The New England Fruit Meetings and Trade Show will be held at the New Hampshire Highway Hotel, Concord, New Hampshire. The meetings are scheduled for January 10 and 11, 1968.

The hotel is accessible to all major highways. Routes 3 and 93, which lead to Concord, are accessible from anywhere in Massachusetts. Persons coming from western Massachusetts and southern Vermont may find Routes 9 or 10 to Keene, New Hampshire, and then Routes 9, 202, 89 and 93 to the Highway Hotel most convenient.

****

DICHLOBENIL, A PROMISING HERBICIDE FOR THE ORCHARD

W.J. Lord and D.A. Marini
Extension Pomologist and Regional Agricultural Specialist

A weed control program based on late-fall application of granular herbicides would be of value to orchardists, because the spring work load in orchards is heavy. Granular dichlobenil recently was labeled for late fall use to control a broad spectrum of perennial and annual weeds under fruit trees, but its effectiveness in Massachusetts has not yet been established. Granular simazine, however, has been tested for fall application, and while earlier studies by Lord and Wilder showed that this herbicide was ineffective with fall application, some fruit growers have reported results to the contrary. Therefore, in the fall of 1965, a study was initiated to evaluate the effectiveness of fall applications of granular dichlobenil, in comparison with granular simazine for weed control in orchards. Test plots were established at the University apple orchard in Belchertown, the University peach orchard in Amherst and the Ashley peach orchard in Acushnet.

At the time of treatment in November, 1965, the primary weeds in the established sod at the Belchertown orchard were quack grass, orchard grass, sweet vernal grass, red fescue, dandelion and timothy. Weeds at the Amherst peach orchard, grown under the sod-mulch system of culture, were primarily quack grass, Kentucky bluegrass, orchard grass, dandelions, yellow foxtail and red sorrel. The Ashley peach orchard was kept under cultivation except for an area approximately 12 feet in diameter around the trunk. This area was in sod principally composed of Kentucky bluegrass, orchard grass, quack grass and bentgrass. The broadleaf weeds present included broadleaf plantain, buckhorn plantain, common chickweed, yarrow, red clover, curly dock, sorrel and dandelions.

G simazine and G dichlobenil were applied on 2 dates in November, 1965, in each orchard (Table 1). The materials were hand broadcast over a circular area 4 feet in radius from the middle of

the trunk of each peach tree in the test. In the apple orchard, the herbicides were applied to a circular area 8 feet in diameter on grassy areas between the trees. The concentrations used are indicated in Table 1. Single-tree plots were used and each treatment was replicated 10 times in each orchard.

RESULTS AND DISCUSSION

The fall applications of G dichlobenil provided outstanding weed control from May into October in 2 of the 3 orchards, whereas fall applications of G simazine failed to provide acceptable weed control at any location (Table 1).

Table 1. Effectiveness of fall applications of granular simazine and granular dichlobenil for the control of weeds in the orchards.

	Percent weed control, 1966								
	Acushnet			Amherst			Belchertown		
Treatment[1]	6/28	9/7	10/6	6/13	9/8	10/6	6/13	9/8	10/6
Simazine									
Early Nov.	44	38	25	59	24	22	60	30	29
Mid-Nov.	47	29	28	77	28	28	74	48	44
Dichlobenil									
Early Nov.	95	93	90	98	91	90	95	41	44
Mid-Nov.	97	91	87	99	89	87	95	52	43

[1]G simazine and G dichlobenil applied at 3.2 lb ai/A and 8.0 lb ai/A, respectively. Dates of application 11/1/65 and 11/15/65 at Amherst and Belchertown; at Acushnet 11/4/65 and 11/19/65.

Analysis of variance of the data in Table 1 showed that in June the percentage weed control from the late application of herbicides at the 3 locations was significantly better than that from the earlier application. By September, however, this influence of timing was no longer apparent.

The interaction of location and material was significant on each of the 3 observation dates. At all locations in June, weed control from dichlobenil was significantly better than from simazine. The percentage weed control with simazine at Acushnet in June was significantly less than at Amherst and Belchertown. In September and October, weed control with dichlobenil was significantly less at Belchertown than at Amherst and Acushnet and the effectiveness of simazine and dichlobenil at Belchertown did not differ significantly. Weed control with dichlobenil was significantly better than with simazine at Acushnet and Amherst in September and October, however.

At the concentration used, simazine failed to eradicate the well-established perennial grasses, particularly at Amherst and Acushnet, and dandelions were tolerant to the herbicide. These observations are in agreement with earlier findings by Lord and Wilder and indicate that simazine should be used with a contact herbicide that will eradicate dandelions and improve the control of perennial grasses.

The unsatisfactory weed control in the dichlobenil plots at Belchertown was due to the tolerance of sweet vernal to this herbicide. Due to reduced competition from other weeds, the growth of the sweet vernal scattered throughout 19 of the 20 plots was vigorous and the percentage of weed-covered area decreased from 95% on May 25 to 43% on October 6.

Although dichlobenil failed to completely eradicate all the well-established perennial grasses and even though some infiltration of these grasses from the periphery of the plots occurred, the control obtained with this herbicide was comparable to that obtained with spring application of herbicides in other experiments by the authors. As the summer progressed, annual broadleaf weeds and grasses---principally smooth crabgrass, barnyard grass, threeseed mercury and yellow foxtail---invaded both the simazine and dichlobenil plots.

At Amherst, Acushnet and Belchertown on October 6, 1966, dandelions were present in 90%, 70% and 40% of the simazine-treated plots, respectively. However, this weed was almost completely eradicated from all dichlobenil plots in the 3 orchards. Prior to treatment, broadleaf plantain, buckhorn plantain and sorrel were prevalent in the plots at Acushnet. The control of these broadleaf weeds with dichlobenil was outstanding, whereas simazine did not control them.

Quackgrass, Kentucky bluegrass, orchard grass, dandelions and sorrel are the predominant weeds in most Massachusetts orchards grown under the sod-mulch system of culture. Since dichlobenil gave outstanding control of these weeds, further testing of this herbicide is warranted. However, lower rates of application must be tested since it is labeled for use in orchards at 4 to 6 lbs ai/A.

SUMMARY

The effectiveness of fall applications of granular simazine at 3.2 lab ai/A and granular dichlobenil at 8 lb ai/A for the control of grasses and broadleaf weeds in peach and apple orchards was evaluated. Dichlobenil gave outstanding season-long control of perennial grasses and broadleaf weeds except for sweet vernal grass, while simazine failed to provide acceptable control. The control of dandelions, broadleaf plantain, buckhorn plantain and red sorrel with dichlobenil was outstanding. However, further work is needed to determine the effectiveness of dichlobenil at lower rates.

****

POMOLOGICAL PARAGRAPH

Harvesting Cultivated Blueberries Mechanically - According to J.H. Levin, Leader, Fruit and Vegetable Harvesting Investigations, AERD, ARS, USDA, East Lansing, Michigan, over 85% of the 1966, blueberry crop in Michigan was harvested with hand held vibrators. These devices enable a worker to harvest blueberries at rates 6-7 times as fast as by hand. - (Levin, J.H. 1967. Harvesting fruits and vegetables mechanically. *N.J. Hort. Soc. Hort. News*. 48(No. 2): 22, 24, 26, 28.

****

RESEARCH FROM OTHER AREAS

William J. Lord
Department of Plant and Soil Sciences

Effect of Sunlight on Apples During the Growing Season: The effects of exposure to different amounts of sunlight on size, color, soluble solids, firmness, acidity and pH of McIntosh and Red Delicious apples were studied by D.R. Heinicke and reported in Volume 89 of the *Proceedings of the American Society for Horticultural Science*.

The study showed that there are 3 distinct light zones in apple trees which affect fruit quality in British Columbia: a zone of inadequate light for marketable fruit (less than 40% full sunlight (FS); a zone of adequate light (40 to 60% FS); and a zone for optimum development of fruit quality (above 60% FS).

Red color development was directly related to exposure, with the best color found on fruit exposed to 70% or more of possible FS. Exposure to 40 to 70% FS was adequate, while less than 40% was inadequate for red color development. Exposure to light also had an effect on the fruit size of both varieties, but the size reduction was greatest on McIntosh exposed to less than 30% FS. These data indicate that for the best development of fruit size and color, the fruiting areas must be exposed to at least 50% FS.

For both varieties, soluble solids content (which represents sugar content) was related to exposure to light, becoming progressively lower with decreasing light exposure. Flesh firmness of McIntosh decreased with increased light exposure. Heinicke believed, however, that this was an indirect effect of light caused by its effect on fruit size and maturity, rather than a direct effect of light exposure. Nevertheless, it is interesting to note that there was no firmness difference in Delicious despite a substantial size difference. The pH and acidity of the juice from fruit of neither variety was affected by light exposure.

Editor's Note: The data obtained by Heinicke re-emphasize the importance of pruning. Trees should be pruned so that all the fruit spurs have reasonably good exposure to light. This means development of a uniformly "thin" tree and the gradual elimination of older shaded parts which tend to produce inferior fruit. At harvest time, you have a good opportunity to observe the color and size of fruit on different parts of the tree. The number and location of small, poorly colored apples show which branches or parts of branches need attention during the pruning season.

****

Comparison of Growth Habit and Leaf Composition of Starkrimson and Starking Delicious Trees: M.N. Westwood and Q.B. Zielinski, Oregon State University, Corvallis, compared 3-or-4-year-old trees of a compact mutant Delicious (Starkrimson) with standard Starking Delicious as to growth habit, leaf structure, and chemical constituents of the leaves. The results of this study were reported in the Proceedings of the American Society of Horticultural Science 88: 9-13, 1966. Starkrimson had shorter shoots, fewer lateral shoots, more fruiting spurs, more nodes per foot, and more leaves and leaf surface per foot than Starking. Starkrimson leaves were thicker, contained a greater dry weight, and more chlorophyll, nitrogen and calcium than did Starking.

The authors concluded that the growth characteristics of Starkrimson in comparison to Starking Delicious are more favorable for light distribution,bearing surface, photosynthetic efficiency and production potential.

****

Suitability of Strawberry Varieties for Freezing: James F. Gallander, Ohio Agricultural Research and Development Center, Wooster, Ohio, studied the suitability of 15 strawberry varieties for freezing. The berries were frozen for 6 months and then thawed and evaluated by a taste panel for color, flavor and texture. The Premier variety was used as a standard of comparison.

Earlidawn, Midway and Pocahontas were rated significantly better in color than Premier because of their attractive, bright and uniform red color. The most preferred variety in regards to color was Earlidawn which has bright red centers.

Fletcher and Frontenac were rated good but their color scores were not significantly better than Premier. The 2 varieties least preferred for color by the taste panel were Armore and Jerseybelle.

Flavor differences among varieties was minor and no variety preference could be established from the study. This lack of difference may have been due to the sugar added during processing.

Earlidawn, Midway, Pocahontas, Surecrop, Fletcher, Fulton, Sparkle and Frontenac all rated significantly higher in texture than Premier. Those preferred by the taste panel for their firm texture and considered highly acceptable for freezing were Earlidawn, Midway, Pocahontas and Surecrop. On the other hand, Premier was extremely soft and was rated lowest and unacceptable by the taste panel. Other varieties ranked low for texture were Empire, Catskill, Jerseybelle, Armore, Robinson and Erie.

Although several varieties were acceptable for freezing by the taste panel, Earlidawn, Midway, Pocahontas and Surecrop were selected as being outstanding in the 3 qualities scored---color, flavor and texture. The frozen fruit of these varieties was characterized as having firm texture, good flavor and attractive red color

****

Effect of Winter Mulches on Strawberry Yields. Investigations by W.D. Collins, Canada Department of Agriculture, Fredericton, New Brunswick, Canada, and reported in Volume 89 of the Proceedings of the American Society for Horticultural Science, showed that over a 5-year period mulches of oat straw, evergreen boughs and shavings provided adequate winter protection for strawberries. Yields were less when the plants received no winter protection, were mulched before temperature at crown level fell to 20°F, or were mulched with sawdust or fall-seeded oats. Applications of extra nitrogen increased yields of the sawdust-mulched plots substantially during the final 2 years of the study, however.

The amount of oat straw used (1.5, 3.0 or 4.5 tons/acre) had no effect on yield in 3 of the 5 years. In the other 2 years, however, lower yields followed mulching with 4.5 tons of straw. These results indicate that a thick mulch is not only unnecessary, but also may reduce yield of strawberries.

The number of times the temperature at crown level dropped to between 32°F and 20°F, or the accumulated cold units expressed as degree-days-below-40°F, appeared to be useful indices for determining the time to mulch. Yield was almost invariably depressed when less than 10 light frosts preceded the mulch application, and 15 to 20 frosts were optimal. Plants mulched at 60 to 80 degree-days-below-40°F after October 1, produced good crops.

****

POMOLOGICAL PARAGRAPH

Publication Available: Growers of strawberries should find of value, Washington State University (Pullman, Washington) Extension

Bulletin, entitled "Strawberry Nutrient Deficiency Symptoms." This bulletin describes 9 nutrient deficiency symptoms of strawberries, and contains colored illustrations of these deficiencies.

****

CIDER NOTES

Kirby M. Hayes
Department of Food Science and Technology

A question that often arises is how to make good cider. Although there is no easy answer, or hard and fast rules, two of the most important factors to consider are maturity and variety.

Maturity

Firm-ripe apples--- those that are ripe enough to eat out of hand---make the best cider and give the highest yield. Immature or overripe apples lower the quality. Early-maturing varieties should be allowed to ripen sufficiently to yield a high-quality juice.

Variety

The best cider is usually made from a blend of different varieties of apples. A blend provides an appealing balance of sweetness, tartness, and tang, as well as aromatic overtones.

A single variety of apple seldom makes a satisfactory cider. However, McIntosh has been used alone successfully, but only at the peak of its maturity.

Sometimes the desired fullness and balance can be obtained from two varieties. A blend of three or more varieties is better. Using several varieties permits greater latitude in varying the proportions to obtain the desired blend, and also allows practical management of the available supply.

Many commercially important varieties may be separated into four groups according to their suitability as cider material: Sweet subacid, mildly acid to slightly tart, aromatic and stringent. A strict classification is not possible because many varieties have a number of different flavor characteristics. For example, Delicious may be listed in both the sweet subacid and aromatic groups. Moreover, varieties differ in their characteristics from one area to another.

Varieties in the sweet subacid group are grown primarily for eating raw; they usually furnish the highest percentage of the total stock used for cider.

Varieties in the aromatic group have outstanding fragrance, aroma and flavor that are carried over into the cider.

Crabapples, in the astringent group, provide tannin - a constituent difficult to obtain in making a high-grade cider. The juices of this astringent group also are highly acidic. Only a small quantity of these apples should be used in the blend.

Use the following list as a guide in selecting the right blend of varieties.

Sweet subacid group: Baldwin, Delicious, Cortland, Spartan, Empire, Macoun

Mildly acid to slightly tart group: Winesap, Jonathan, Northern Spy, R.I. Greening.

Aromatic group: Delicious, Golden Delicious, McIntosh,

Astringent group: Florence Hibernal, Red Siberian, Transcendent, Martha.

By fitting the above suggestions to your operation, using sound clean apples, pressing in a clean mill, and storing and displaying the finished product under refrigeration, you can keep your customers coming back for more.

****

All pesticides mentioned in this publication are registered and cleared for the suggested uses in accordance with state and federal laws and regulations. Where trade names are used for identification, no product endorsement is implied nor is discrimination intended.

WARNING: MOST PESTICIDES ARE POISONOUS. READ AND FOLLOW ALL DIRECTIONS AND SAFETY PRECAUTIONS ON LABELS, HANDLE CAREFULLY AND STORE IN ORIGINAL CONTAINERS WITH COMPLETE LABELS, OUT OF REACH OF CHILDREN, PETS AND LIVESTOCK.

Cooperative Extension Service
University of Massachusetts
Amherst, Massachusetts
A. A. Spielman
Director
Cooperative Agricultural Extension Service
Acts of May 8 and June 30, 1914
—
Official Business
418 — 11/67 — 970
Permit No. 1216

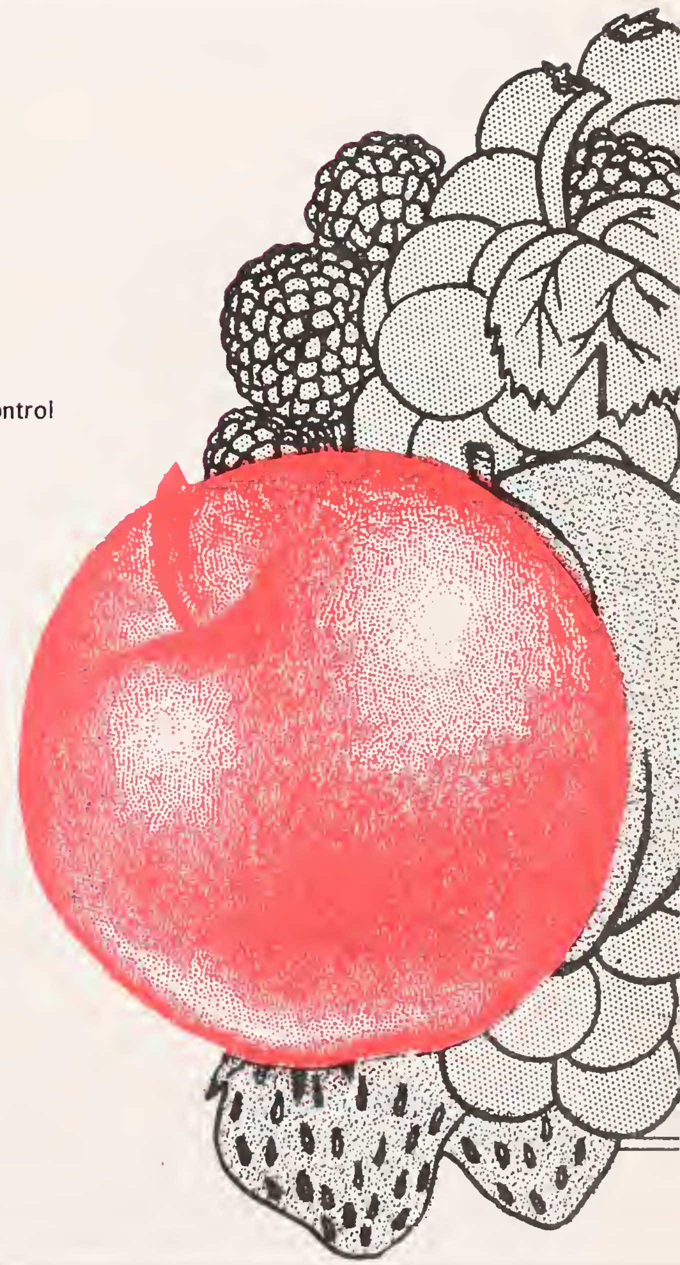
Postage and Fees Paid
United States Department of Agriculture

FRUIT NOTES

Prepared by the Department of Plant and Soil Sciences
Cooperative Extension Service
College of Agriculture
University of Massachusetts, Amherst

EDITORS

W. J. LORD AND W. J. BRAMLAGE



JANUARY–FEBRUARY, 1968

TABLE OF CONTENTS

Issued by the Cooperative Extension Service, A. A. Spielman, Dean and Director, in furtherance of the Acts of May 8 and June 30, 1914; University of Massachusetts, United States Department of Agriculture and County Extension Services cooperating.

PERENNIAL PEACH CANKER
ITS CAUSES, DEVELOPMENT AND CONTROL

George N. Agrios
Department of Entomology and Plant Pathology
University of Massachusetts

There is probably no peach orchard in the state that does not have at least some trees whose branches or trunks are infected with the perennial peach canker. In some orchards, however, so many peach trees are infected with cankers and so severe are the infections, that heavy losses in yield and in trees occur annually. And, as it happens with most diseases, the orchards with severe infections of peach canker can expect more of the same or even worse losses unless measures are taken to control the disease.

What is Perennial Peach Canker?

The perennial peach canker is an area on a peach twig, branch or trunk in which the plant tissues are dead, discolored, collapsed and, sometimes, disintegrated. In young cankers, the bark may still be in place, but the tissues underneath are brown, dead and filled with gum. In older cankers, the original bark has usually been broken up and has become disorganized, the tissues underneath have disintegrated and turned black and the margins of the canker are usually raised by means of rolls of callus tissue produced in the healthy areas surrounding the canker. In the spring, young and old cankers usually exude gum which at first is colorless or amber-colored, but later turns brown.

Cankers are usually spindle-shaped or ellipsoidal at first and surround a stub, twig or dead limb. Cankers grow much longer up and down the limb than they do laterally on the limb. They may grow several inches in length per year and continue to grow for several years.

Cankers damage trees by girdling and killing the limbs above the canker, or by so weakening the limbs that they break off under the stress of a storm or of the weight of a fruit crop. Limbs weakened by cankers either die or grow so poorly that they are pruned off and are lost to production. Cankers on the trunk may keep trees sickly and unproductive for many years and sooner or later cause the death of the tree.

What Causes the Perennial Peach Canker?

Perennial peach cankers are caused by either one of the two fungi, *Valsa cincta* and *Valsa leucostoma*. The name *Cytospora* usually reserved for the asexual stage of the fungus, is frequently used instead of *Valsa*, since the *Cytospora* stage is by far the one most commonly found in nature. The disease is also known as Valsa canker or Cytospora canker.

The two fungi, *V. cincta* and *V. leucostoma* resemble each other in morphological characteristics and ability to cause disease, but they differ from each other in the range of temperature that favors their growth. Both fungi start to grow when the temperature is about 38°F. *V. cincta's* growth rate improves steadily and quickly as the temperature rises, and it reaches its peak between 65-70°F. Above that, growth begins to decline and comes to a halt at about 86°F. On the other hand, *V. leucostoma* gets off to a slow start at low temperatures, but its growth continues to improve and is fastest at 81-86°F. Above that temperature, the growth rate declines again, but complete cessation of growth does not occur until the temperature becomes about 104°F.

Both *Valsas* live in the bark and sapwood of infected or dead trees and branches. The fungi sporulate soon after the death and collapse of the cells of recently invaded bark of new or old cankers. Numerous pimple-like pysnidia appear over the surface of the cankers, each pysnidium containing up to 100,000 spores. When the spores are exuded, they are embedded in a sticky substance and, during wet periods, form long amber-colored tendrils. The spores, being sticky, are not spread by wind but are easily disseminated by insects, birds and man. Splashing rain may also spread spores over short distances. In general, the spores of these fungi are disseminated over relatively short distances and the incidence of cankers is inversely proportional to the distance from the source of spore supply.

How Perennial Peach Cankers Develop

The spores of the peach canker fungi are released during March, April and May and, sometimes, in early June. Most cankers originate from infections that take place during late March, April and May, although a second wave of infections take place during October and November. Depending on the locality and the prevailing weather conditions within each year, these periods may be longer or shorter, but it is evident that infections take place during the cool months of the year, although, presumably, spores are present throughout the year. Both the low winter temperatures and the high temperatures of the summer months seem to effectively inhibit initiation of new infections.

Even when the temperature is favorable, spores can cause infection only when they land on injured or dead bark. The most common point of entry of the fungus, especially in young trees, seems to be unhealed pruning wounds and stubs. This is followed, in order of lesser importance, by fruit spurs or pedicels, terminal dieback, dead buds, winter injury, mechanical injury, lenticels, leaf scars, insect borers, etc. Extreme winter cold seems to be the most important factor in predisposing peach trees to perennial canker through resulting injuries to peach trees, such as bud killing and dieback of twigs.

Soon after landing, the fungus spore germinates and the mycelium it produces feeds and grows on the injured or dead cells of the plant. As the fungus grows, it produces toxic substances (enzymes and possibly toxins) which cause disintegration, death and collapse of the plant cells. These substances advance and cause their effects some distance ahead of the mycelium, so that the fungus probably never comes in contact with living cells, but instead, lives off the dying or dead tissues. The fungus also grows into the sapwood by intercellular and intracellular penetration and becomes more deep-seated and difficult to reach by the end of the first season's development of the canker.

Wounding or killing of peach tissues results in the production of wound gum in the surrounding areas when moisture and temperature conditions are favorable. When a wound becomes infected with the *Valsa* fungi, however, the wound gum region is much more extensive than in an uninfected wound. Such gum is usually proportional to the amount of tissues killed and is known to serve as a barrier to further invasion of tissues by fungi. The *Valsa* fungi, however, although slowed down by the wound gum barrier, are not stopped and can grow through it by means of appressoria and slender penetration threads.

The seasonal development of the canker varies with the *Valsa* species that causes it. *V. cincta* cankers enlarge during the cool spring months, remain unchanged during the hot months of summer, resume their expansion again in October and continue to enlarge until the low winter temperatures set in. The canker begins to enlarge again the following spring, following the same stages of development. *V. cincta* cankers enlarge most rapidly during the first two years and may become one foot or more long. In the next few years, the rate of expansion is slower and cankers seem to become inactive after 5 or 6 years of activity. The *V. leucostoma* fungus, which prefers higher temperatures, also becomes active and causes enlargement of cankers in the cool spring months, but, unlike *V. cincta,* it remains active during the summer months and well into the fall until the advent of the low winter temperatures. Thus, the *V. leucostoma* cankers continue to enlarge through the summer and fall. *V. leucostoma,* however, is an even weaker parasite than *V. cincta,* and the overall size of cankers produced by *V. leucostoma* is much smaller than that of *V. cincta* cankers. These cankers also continue to enlarge for several years, but the annual expansion after the first two years is quite small. *V. leucostoma* cankers seldom become longer than 3 or 4 inches before they become inactive.

In vigorous trees, the advance of the canker is stopped quickly by the formation of a ring of callus tissue which heals the wound and inhibits the further growth of the fungus. In trees of poor vigor, however, or trees weakened in any way, callus formation is slow and the fungus usually advances before such tissue can form. In weakened trees callus is formed during the periods of cessation of growth of the fungus, such as during the hot months of the summer or during the warm spells in the winter, but even these callus

tissues are too weak to stop the advance of the pathogen once it is well established in the plant.

How Can Perennial Peach Cankers be Controlled?

There is no single, effective and easy control measure for this disease. One must keep in mind, however, that it is mostly trees of low vigor that become infected, that the pathogen can spread to trees only when it is present nearby, and that it can attack trees either by penetrating through unhealed wounds or by first growing on dead twigs, buds, etc. A control program depends largely on doing well the many things required to keep the trees in good vigor, to eliminate nearby sources of the pathogen, to prevent unnecessary wounding of peach trees and aid rapid healing of unavoidable wounds, and to minimize killing of bark, twigs and buds by low winter temperatures. Certain fungicides have been proven helpful but will not, alone, control the disease.

The following practices followed over a period of years help reduce the spread and prevent development of perennial peach cankers.

Trees should be fertilized adequately and pruned properly to insure vigorous growth. Excessive or late season application of nitrogen ferilizer, which prevents normal maturing of peach trees and increases their susceptibility to early winter injury, should be avoided. Pruning should be done late in the spring after growth starts, and even after bloom, at which time pruning wounds heal quickly and are less frequently infected with canker fungi. Pruning cuts should be made close to the branch, since stubs seldom heal properly and provide ideal sites for canker infections which spread to the larger branches. All dead wood and twigs, killed by any cause, should be cut and, along with the prunings, should be removed from the orchard and burned as soon as possible. Branches with cankers should be removed whenever possible. However, if the cankers are on large scaffold limbs or tree trunks, the infected area should be first cut and scraped, then the cleaned-out wound should be disinfected with 1 part mercuric chloride in 500 parts of water, and, finally, the disinfected wound should be covered with a water-asphalt-emulsion wound dressing. Hopelessly cankered trees should be removed and burned.

To avoid infections by canker fungi through wounds made by insects or through tissues killed by other peach diseases, an effective insecticide and fungicide schedule should be followed. Some fungicides, such as dichlone (Phygon XL*) at 1/2 lb., or Kolo-100*, at 5 lbs. per 100 gallons, applied as dilute sprays to new pruning cuts before rain occurs, especially when pruning is done before bloom, have reduced considerably new canker formation.

---

*Trade name

Recent research by Helton and associates at the University of Idaho indicates that certain chemicals, especially sodium 2-pyridienthiol, 1-oxide (Omadine-1484), and cycloheximide thiosemicarbazone, both in the experimental stage, are systemically absorbed by peach trees and give good preventive, and some erradicant control against the peach canker fungus *Valsa cincta*. Cycloheximide thiosemicarbazone sprays completely protected trees from subsequent infection by canker fungi, while Omadine-1484 not only protected trees from subsequent infections, but it also promoted healing of already infected wounds. Both compounds, when sprayed on trees already infected with cankers, demonstrated therapeutic activity against the established infections.

References

Helton, A.W. and K.G. Rohrbach. 1967. Chemotherapy of *Cytospora* canker disease in peach trees. *Phytopathology* 57: 442-446.

Hickey, K.D. and K.G. Parker. 1967. Peach cankers and their control. *Penn. Fruit News* Vol. XXXXVI (4): 15-20.

Hildebrand, E.M. 1947. Perennial peach canker and the canker complex in New York, with methods of control. *Cornell Univ. Agri. Expt. Sta. Memoir* 276: 1-61.

McCubbin, W.A. 1918. Peach canker. *Can. Dept. Agric.*, Bull. 37, 1-20, illus.

****

FOR TRIAL - RECENT PEACH INTRODUCTIONS

Walter D. Weeks
Department of Plant and Soil Sciences

This trial list of peach varieties is presented so that growers may select new introductions to supplement varieties that they are presently growing. The varieties are listed in approximate order of ripening. Many of them have not yet fruited in our new plantings at the Horticultural Research Center, and some of the more recent ones have not been planted yet. Therefore, the descriptions are based primarily on those given by the originator. The performance of these new peaches under Massachusetts conditions may or may not be similar to that in their place of origin.

Collins is a medium sized early peach that ripens before Sunrise. The tree is hardy, vigorous and productive. The flesh is yellow and quality is good for an early peach. It is semi-cling when picked.

Golden Dawn is a seedling peach that was discovered in the Bolton orchard of Jonathan Davis in 1953. It is a yellow peach of high

quality which ripens about the time of Erly-Red-Fre. Golden Dawn apparently is hardy of bud as it was one of the few varieties to have fruit this past season.

Reliance is a new introduction from the New Hampshire Agricultural Experiment Station which is extremely bud hardy. It has survived minimum temperatures of -25°F. The fruit is nearly round, moderately fuzzy and has a dull red color. The bright yellow flesh is juicy, medium firm, slightly stringy, of good flavor and ripens with Golden Jubilee or about 24 days before Elberta.

Sunqueen, an attractive, high quality peach that ripens with Sunhigh. It was selected because it is somewhat more resistant to bacterial spot than Sunhigh.

Washington is the first of a new series of introductions from Virginia. Its flowers are reported to be extremely tolerant of spring frosts. The fruits are round ovate in shape. The skin is about three fourths covered with bright red color. The flesh is orange yellow with bright red at the pit. The flesh is fine textured; its flavor resembles Sunhigh but is slightly more acid. Washington ripens about 3 days after Triogem or 21 days before Elberta.

Glohaven is one of Stanley Johnston's latest introductions from Michigan. Its fruit buds and blossoms are above average in hardiness. The fruits are large and nearly round in shape. The skin is highly colored and has very light pubescence or fuzz. Fruit flesh is clear yellow and firm textured. There is very little red color around the pit cavity. The fruit ripens just after Halehaven or about 14 days before Elberta.

Redqueen was selected by the New Jersey Agricultural Experiment Station because of its bud hardiness. The fruit is large, well colored and of good quality. It has as much firmness and shelf life as Elberta. It is of the same season as Glohaven or about 14 days before Elberta.

Cresthaven is another introduction from Michigan which is above average in wood and bud hardiness. Fruits are medium-large and nearly round in shape. Fruit skin has an abundance of bright red color with no noticeable pubescence. The flesh is clear yellow and firm textured. There is considerable red color around the pit cavity. Cresthaven ripens between Summercrest and Blake or about 7 days before Elberta.

Madison is one of the frost resistant introductions from Virginia. The fruit has medium size and is highly colored. Pubescence is short and fruit is above average in attractiveness. The flesh is bright orange yellow, firm and fine textured. It has a mild, rich flavor. It ripens 7 days before Elberta.

Jerseyqueen is a New Jersey peach which was introduced to replace Elberta. Fruits are well colored, being bright red, large, round and firm. Flesh is yellow with very good mild flavor. The fruits of Jerseyqueen hold up very well in shipping and handling. It ripens with Elberta.

Jefferson is another of Virginia's introductions which has blossoms that are resistant to spring frosts. The fruits are large and well colored. The flesh is yellow and comparable to that of J.H. Hale in firmness and flavor. Jefferson ripens two to three days after Elberta.

****

RECENT SMALL FRUIT INTRODUCTIONS

James F. Anderson
Department of Plant and Soil Sciences

Two blueberry varieties, Lateblue and Elizabeth were introduced in 1967. Neither of these has been tested in our University plantings and the following notes are taken from the introducers' descriptions. We have fruited the Gala strawberry.

Lateblue was introduced by the U.S.D.A. and the New Jersey Agricultural Experiment Station. The plants are erect, vigorous and consistently productive. The fruit is borne in medium-sized clusters. The berries are highly flavored, firm, light blue in color and have small stem scars. They are smaller and ripen about one week after Coville. One of its outstanding features is simultaneous ripening of fruit in a short period of time.

Elizabeth was developed by the late Miss Elizabeth White and was introduced by the New Jersey Cultivated Blueberry Council, Inc. It has an unusually long picking season. The berry color is a medium blue and its size very large being about equal to Herbert. Its dessert quality and flavor are rated as excellent. It is very sweet and aromatic. The clusters are very loose and easily picked. The scar is small. Elizabeth is similar to Coville in vigor and growth habit. The plant is said to be a good producer and to be hardy. Elizabeth appears to thrive best on moderately peaty soils and is not recommended on very sandy soils

Gala was introduced in 1966, by the New York Agricultural Experiment Station. It is a very early ripening variety. As grown in our plots, the berries were medium in size, moderately firm, slightly rough and irregular in shape. The plants were vigorous and moderately productive. Though the variety did not appear to be promising as grown under our conditions, growers desiring a very early ripening variety may find it worthy of trial.

****

PEAR VARIETY NOTES

James F. Anderson
Department of Plant and Soil Sciences

Because of an increased interest in pear growing in Massachusetts, particularly by those operating roadside stands, the following comments are reprinted from earlier issues of *Fruit Notes*. Harvest dates and pressure test readings mentioned in the write-ups are for the 1965 harvest season and are given as a point of interest only. Harvest dates will vary from season to season and orchard to orchard. The pressure tests were made with a Magness-Taylor pressure tester, using a 5/16" diameter head in contrast to the 7/16" diameter head used for apples. The following 7 varieties have been recommended for commercial planting in Massachusetts for a number of years.

Clapp Favorite The fruit is large, greenish-yellow with a blushed cheek and good in quality. The fruit has a high susceptibility to core breakdown if picked late. The fruit is usually ready for harvest in mid-August in Amherst. The tree is hardy and productive, but it is highly susceptible to fire blight.

Bartlett A medium to large, attractive, high quality pear. Bartlett is picked in late August or early September. We picked Bartlett on August 27, when the average pressure test reading was 20 pounds. The tree is medium in size and is productive.

Gorham A seedling of Bartlett which it resembles in size and color. The flesh is white, tender and juicy. Unlike most pear varieties, the fruit will ripen in cold storage. Last season the fruit held up well in storage until the end of January. The fruit was harvested on the 3rd of September when the average pressure test was 13 pounds. This fruit was eating ripe in cold storage in early December. Gorham is said to require a higher level of nutrition than Bartlett to maintain production.

Seckel A popular variety for pickling. The fruit is small, often with a bronze russet and very high quality. The tree is large, upright spreading and productive in alternate years.

Flemish A large attractive, high quality pear. The fruit was picked September 3rd, when the average pressure test was 12 pounds. Flemish is susceptible to pear scab, but this can be readily controlled with present fungicides. The tree is large, vigorous, very hardy and productive in alternate years.

Bosc This russeted pear is harvested in late September. The fruit was picked September 22nd, when the average pressure was 14 pounds. The crop was very heavy and there was some fruit drop. The fruit is large and has excellent flavor when ripened properly. Stored fruit was in excellent condition in late December. The tree is productive with a slight tendency towards biennial bearing.

The following four varieties have been under test in our University plantings for a number of years and appear to be worthy of trial.

Chapin A seedling of Seckel that is harvested in early August. The fruit is small to medium in size, green with a red blush. Chapin resembles Seckel except for a more prominent neck. The flesh is fine textured, juicy, free of grit cells and of good quality.

Starkrimson A red bud sport of Clapp Favorite. The fruit is similar in size, shape and quality to Clapp, but has a solid red surface color. The fruit was harvested August 20th and held up well in storage to early December. This variety would add color and interest to a pear display, but we are not certain as to the buyers' reaction to a red pear.

Packham's Triumph The fruit is large in size, greenish-yellow in color, free from blemishes and although the surface is somewhat rough it is an attractive pear. The flesh is white, fine melting, free of grit cells and of very good quality. The fruit is harvested in late September and holds up well into early January. As the fruit was harvested from a top-worked tree, an evaluation of tree characteristics cannot be given.

Dumont A late ripening pear of medium size, obtuse pyriform shape and yellow color. The flesh is firm, juicy and the quality very good. The fruit is harvested in late September and has kept well into early January in the past years. The variety has been productive under our conditions and is worthy of trial.

****

All pesticides mentioned in this publication are registered and cleared for the suggested uses in accordance with state and federal laws and regulations. Where trade names are used for identification, no product endorsement is implied nor is discrimination intended.

WARNING: MOST PESTICIDES ARE POISONOUS. READ AND FOLLOW ALL DIRECTIONS AND SAFETY PRECAUTIONS ON LABELS, HANDLE CAREFULLY AND STORE IN ORIGINAL CONTAINERS WITH COMPLETE LABELS, OUT OF REACH OF CHILDREN, PETS AND LIVESTOCK.

Cooperative Extension Service
University of Massachusetts
Amherst, Massachusetts
A. A. Spielman
Director
Cooperative Agricultural Extension Work
Acts of May 8 and June 30, 1914
—
Official Business
427 — 1/68 — 970
Permit No. 1216

Postage and Fees Paid
United States Department of Agricultur

FRUIT NOTES

Prepared by the Department of Plant and Soil Sciences
Cooperative Extension Service
College of Agriculture
University of Massachusetts, Amherst

EDITORS

W. J. LORD AND W. J. BRAMLAGE

MARCH–APRIL 1968

TABLE OF CONTENTS

Issued by the Cooperative Extension Service, A. A. Spielman, Dean and Director, in furtherance of the Acts of May 8 and June 30, 1914; University of Massachusetts, United States Department of Agriculture and County Extension Services cooperating.

NEW ENGLAND APPLE HARVESTING AND STORAGE SYMPOSIUM

A New England Apple Harvesting and Storage Symposium will be held on March 26 and 27, at the University of Massachusetts. Presentations will be made on recent research and developments in apple harvest mechanization, storage construction and management, and in post-harvest problems. The main topics for the first day of this symposium are: (1) adapting orchards for mechanical harvesting; (2) harvesting aids for standard-sized trees; (3) harvesting from tree walls; and (4) extending the harvest season with Alar. Featured speakers will be A. Berlage, USDA, Wenatchee, Washington; J.H. Levin, USDA, East Lansing, Michigan; C.T. Morrow and L.D. Tukey, Pennsylvania State University; G.E. Rehkugler, Cornell University; J.C. Cain, Geneva, New York; Alfred Barney, Easton, Connecticut; and F.W. Southwick and L.F. Whitney, University of Massachusetts.

Demonstration of Massachusetts' apple harvesting aid and an evening of films on mechanical harvesting is planned with opportunity for informal discussion.

Storage disorders and quality evaluation, CA storage atmosphere regulation and storage structures, and fruit handling are the major topics for the second day. "Off-campus" speakers on this day will be Paul Jensen, Atlantic Research Corp.; J.H. Levin, USDA; and Nathan Chandler, grower, Sterling Junction, Massachusetts. Members of the Agricultural Engineering Department, University of Massachusetts, making presentations are J.W. Zahradnik, J.R. Manson, S.W. Fletcher and C.A. Johnson. W.J. Bramlage and F.W. Southwick, Department of Plant and Soil Sciences are also featured speakers.

Since the symposium is scheduled during the spring recess at the University, overnight accommodations, dining facilities and <u>ample</u> parking space are available on campus.

Registration for the symposium is necessary. Registration forms and programs will be mailed to fruit growers in Massachusetts by the Regional Fruit Specialists; to growers in the other New England States by their State Specialists. Others desiring information on this program should contact Professor R.G. Light, Agricultural Engineering Department, University of Massachusetts, Amherst.

****

THE USE OF BORON ON APPLE TREES IN THE CHAMPLAIN VALLEY OF NEW YORK

Arthur B. Burrell, Peru, N.Y.
Emeritus Professor of Plant Pathology, Cornell University

The symptoms[1] now recognized as those of boron deficiency evidently have occurred here since the 1860's. Outbreaks of boron deficiency symptoms usually have been related to drouth with losses being minor in years of good moisture supply. However, on certain sites, boron deficiency symptoms occurred every year and no orchard of the area totally escaped losses from boron deficiency before boron treatments were made.

Now every fruit grower applies boron as consistently as he applies nitrogen. This is regarded as insurance. The usual practice is to include Solubor*at the rate of one-half pound per 100 gallons in two sprays soon after petal-fall. When this is done annually, the exact stage of development of the trees is not important. Usually one boron spray is applied about ten days after petal-fall and the other at 20-30 days after petal-fall. The Solubor is added to whatever pesticides are being used. No incompatibilities have been identified but deliberate experiments with some of the newer pesticides have not been made. The grower usually attempts to avoid extremely hot weather and to avoid applying it just ahead of a heavy rain, but no critical tests of these factors have been made.

Pesticide spraying in this area usually is at 4X to 6X concentration. Burrell Orchards have used 8X for 14 years. The Solubor is correspondingly concentrated and the gallonage per tree reduced. The aim is to apply about 2 pounds per acre at each of the 2 applications. This results in 4 pounds per acre per year on mature orchards. When the tank is mixed at one-half pound per 100 gallons (dilute spray basis), the amount received by young trees in normal pesticide sprayings seems to meet their needs for boron, although this is far below 4 pounds per acre on a very young orchrd.

Mild injury to a few leaves close to the outlet of the air-blast sprayer is common but of no apparent significance. It shows up mainly as white areas along the midrib. The white occasionally extends a short distance out from the midrib along the principal veins. This evidence of over-dose doubtlessly would be more common if we were to put on the required 4 pounds per acre in one application.

---

[1]Editors' note: Symptoms most frequently recognized by growers are found in or on the fruit--internal cork, pebbled surface of fruit, open calyx or abnormally dark red color of red-skinned varieties as they mature. Symptoms on the vegetative parts of the tree are die-back of shoots and shoots with leaf rosettes.

*Trade name

Mid-terminal leaves collected in early August commonly show about 35 ppm of boron. Leaf-content of boron is not considered a reliable guide to the need for boron applications. A tree could show ample boron during a period of adequate soil moisture, yet later develop boron deficiency in the fruits if a drouth ensued. However, early-August sprays containing Solubor greatly increase the boron content of flesh of fruits harvested in mid-September; thus rapid translocation of boron to the fruit must occur.

Mixed fertilizers containing boron at commonly employed rates have failed to prevent boron deficiency in our fruits. Possibly after enough years of use, results would have been different. However, soil moisture content is well known to influence availability to the plant of soil-contained boron.

Cheap forms of borax such as Granular Fertilizer Borate, High Grade, applied once in 3 years usually prevent boron deficiency symptoms. However, this practice results in a high boron content of plant tissues the year of application with a drop-off in following years. In infrequent cases, there have been deficiency symptoms the third year after treatment. This has been most common when the trees were small the year of treatment and hence got a low rate of application; by the third year, these trees had twice the original bearing area and had greatly increased need for boron.

When applying boron to the ground, ring application under the branches has given the most consistent increases in boron content of apple leaves and fruits. Broadcast applications over the whole orchard area sometimes have been only partially effective. Airplane application on a fairly narrow band no greater than branch spread seemed to be satisfactory in a few tests on bearing trees.

Stippen[2] occurs abundantly on trees of susceptible varieties in spite of the boron treatments routinely applied in the Champlain Valley. Our tests have not shown a relationship between boron and stippen. In some varieties, such as Baldwin, we get a diffused browning of fruit flesh around the apple core from boron deficiency. It is easily eliminated by the use of boron. This symptom does not resemble stippen. (See Cornell Extension Bulletin 426, 1940)

It seems doubtful that the "cork spot" of the variety York is related to boron deficiency of McIntosh and other varieties in New York.

---

[2]Also called bitter pit and Baldwin spot.

****

Pomological Paragraph

Nitrogen Level of McIntosh Trees High in 1967. An unusual number of McIntosh apples were harvested during October, 1967, because the season was late and red color development was slow. Leaf analysis indicated that high nitrogen (N) levels may have been partly responsible for the slow red color development in some orchards.

Research has shown that in comparison with fruit from McIntosh apple trees maintained at moderate levels of N (1.80-2.00 per cent on a dry-weight basis), high N levels (higher than 2.15 per cent) tend to delay both the red and yellow color development of McIntosh apples. Analyses of leaf samples taken during late-July and early August in 1967, from 29 bearing McIntosh blocks in Massachusetts and southern New Hampshire showed that the N level in these blocks averaged 2.3 per cent, which is in excess of the N levels conducive to good red color development.

****

NO LADDERS IN PEACH ORCHARDS?

Ernest G. Christ
Extension Horticulturist
Rutgers - The State University
New Brunswick, N.J.

(Since most growers are interested in minimizing ladder use in peach orchards, the following article reprinted with the permission of E.G. Christ from the January, 1967, issue of Horticultural News, New Jersey State Horticultural Society, should be of interest. The pruning system discussed below requires careful pruning, particularly during the formative years of the peach tree--Editors.)

Several successful peach growers have told me they cannot afford ladders in peach orchards and have not used any for many years. Others are looking toward the elimination of ladders because the economics of peach growing may not permit the use of ladders in the near future. Labor may use a short ladder and go up one or two steps but the seven and 8-foot ladder is probably on the way out.

To eliminate the need for ladders for pruning, thinning and harvesting peaches, it is obvious the trees must be kept low or about seven feet maximum in height. The main framework of the tree must be kept at about five feet maximum in height with annual fruiting wood extending to seven feet. This is done entirely by

pruning of course because we do not use dwarfing rootstocks on peaches. Some growers might say they have been doing just this and it is being done quite generally through the state. Trees are cut hard and held down to size and we are mowing the tops off and holding them down, but this is not exactly what we mean.

Careful Pruning

Careful and perhaps time consuming pruning is required to hold a bearing peach tree at a maximum of seven feet in height and still produce heavy yields. A fast job of mowing or a severe cutting back of the tree may keep it down to size but this kind of pruning often results in heavy sucker growth and not the best production. The tree must be directed to a horizontal spreading form rather than the typical vase shape.

Holding the tree down and spreading begins in about the third year. Strong scaffold limbs are established during the first two years and as the tree begins to produce a bushel or more in the third year it is pruned to grow more horizontal and spreading. Upright shoots are removed and only a minimum of cutting back is done so the weight of the fruit will spread the tree. Careful selection of fruiting wood must be made while pruning. Strong, upright growing wood must be removed in preference to one- and two-foot long unbranched fruiting shoots. Short,weak fruiting shoots should be removed. Three and four-year-old trees may produce quite a bit of undesirable, upright, strong growing shoots as the first pruning is done to make the tree grow in a more horizontal spreading manner. This heavy growth becomes less as the tree bears fruit.

As a peach tree reaches full production (5-8 years) much of the fruiting wood is in a three to four foot band in the top of the tree beginning from seven or eight feet to 11 or 12 feet in height. This low pruning maintains the band of fruiting wood at the four to seven foot level.

New System of Pruning?

Is this a new system of pruning? Perhaps not, but it is not a simple cutting back of the tree to keep it low. It involves more thought and more careful selection of fruiting wood and thinning out of both weak and over vigorous shoots and the saving of the heavily budded one and two foot fruiting shoots. The pruning requires more time than just plain hard pruning because more thinning out of weak wood and selection of the best fruiting wood is done.

We have observed trees pruned to this low system and some have been held to a seven-foot height for 35 years and have good fruiting wood throughout the large spread of fruiting area. Production has been good also--five to eight field crates per mature tree. We have established a few demonstration trees in all peach

producing areas and these will eventually show what is difficult to describe in writing. Some growers may say this is nothing new but this exact type of pruning is not being done in any orchard that I know of.

Can we afford to use ladders in peach orchards? If we want to eliminate the ladder in the peach orchard, it is obvious the tree must be held down to size. The band of productive fruiting wood must be held down to a maximum height of seven feet at pruning. As fruit is produced these limbs will bend down so no ladders are required to harvest the fruit. Also, the hand thinning can be done from the ground. This is a distinct advantage.

To prune a tree to the low--no ladder--system, one must do a careful job and train men to understand the principle and objective. Unless a careful job is done, this system cannot be successful.

****

Pomological Paragraph

Pruning Peach Trees: Peach trees generally made excessive growth in 1967, and those in the formative stage (1-4 years) will need particular attention to eliminate weak crotches that have developed. Scaffold branches with undesirable crotches, but which are well located within the general periphery of the tree, may be left but should be pruned severely so that they will be dwarfed. Eventually, they may be removed if lateral branches develop that might make suitable replacements.

****

VERMONT ORCHARD GROWTH

C. Lyman Calahan, Extension Horticulturist
University of Vermont

A glance at the rate Vermont apple growers have been planting trees in recent years will give the best clue to why the state's apple production has been increasing and is expected to reach average crop-sizes of 1½ million bushels by around 1970.

Since 1955, Vermont orchardists have been adding trees to their orchards at the rate of about 15,000 per year, and during this time only one planting has been made by a newcomer to the industry. The production from these young trees is beginning to add up, and it contributed substantially to the 1,300,000 bushel apple crop in 1967, the largest crop since the "Farm Orchard" lost out

at the time of World War I. Comparing this 1967 crop with the average crop of 700,000 bushels during the 1940-1950 period clearly shows that apple production in the state is on the increase.

The 1966 New England Fruit Tree Survey showed that almost one-half of Vermont's apple trees have been planted since 1955, compared to an average of about 30% for the other New England States. Like neighboring states, Vermont's apple trees are becoming concentrated in fewer and fewer orchards. Over half of the orchards surveyed are made up of 1,000 or more trees. Eleven orchards in the state each have more than 3,000 trees and 5 of these are growing more than 5,000 trees.

About 47% of Vermont's apple trees are in Addison County which is in the heart of the Champlain Valley. Another 20% are growing in the Connecticut River Valley section of the state. Bennington and Rutland Counties account for the remainder of the trees, except for about 4% of the total located in Grand Isle County.

Although about 63% of the trees are McIntosh, this variety produced 80% or more of the apples for the 6 crop years since 1961. Recent plantings contain an even higher percentage of McIntosh and it is anticipated that the production of this variety will increase considerably during the 1970's. Delicious is a poor second and accounts for about 15% of the tree population. Planting rates of Northern Spy and Cortland have not offset tree losses of these varieties since 1945.

Increased interest is being shown in varieties ripening before McIntosh for in-state marketing, but they are not being planted in numbers sufficient to keep Vermont from being an almost one-variety producer, that variety being McIntosh.

****

VARIETIES OF GRAPES FOR MASSACHUSETTS

James F. Anderson
Department of Plant and Soil Sciences

Himrod An early ripening seedless grape resulting from a cross between Ontario and Thompson Seedless. Its clusters are large and rather loose. The berries are medium, oval, sweet, yellow, vinous and good. The vine is not completely winter-hardy under our conditions and should be restricted to the more favored sites.

Van Buren An attractive black grape of good to excellent quality. The vine is vigorous and productive. It is particularly susceptible to downy mildew.

Variety	Recommended for	Harvesting Season
Himrod	T	Very early
Van Buren	C & H	Very early
Ontario	H	Very early
Seneca	H	Very early
Fredonia	C & H	Early
Buffalo	H	Early
Delaware	C & H	Midseason
Worden	C & H	Midseason
Cook	C & H	Midseason
Brighton	H	Late
Romulus	T	Late
Niagara	C & H	Late
Concord	C & H	Late

T = Trial H = Home garden C = Commercial

Varieties so marked are not necessarily equally adapted to all sections of the state. Late ripening varieties are recommended for those areas with a sufficiently long growing season to permit satisfactory ripening of the fruit

Ontario An early ripening white grape of high quality. The clusters are medium in size and tend to be loose. The berries tend to shatter considerably within a few days after harvest. The vines are medium in vigor and productivity and are hardy.

Seneca An early ripening white grape with a thin, tender, adherent skin. The berries are medium in size, oval and have excellent flavor. The clusters are medium in size and compactness. Seneca is susceptible to winter injury.

Fredonia A good quality black grape especially recommended for the roadside stand trade. The clusters are compact and medium in size. The vine is vigorous, hardy and prodictive. It should be pruned less severely than Concord.

Buffalo A black grape with medium to large size, sweet, vinous flavor and good adherence. The clusters are large and tend to be loose. The vine is vigorous and productive and the fruit holds very well in storage. Buffalo tends to overbear if not properly pruned and to be susceptible to winter injury.

Delaware A high quality red grape with small clusters and berries. The vines are hardy and are moderate in vigor and production. Delaware would add to the attractiveness of displays on a roadside stand.

Worden Similar to Concord but ripens a week to ten days earlier. While slightly superior to Concord in quality and attractiveness, it has a tendency to crack when ripe and shatters badly within a few days after it is harvested. A desirable variety for local trade and the home vineyard.

Cook This is an attractive black grape with an abundance of bluish bloom. Adherence of the berries is good and the quality is excellent. Vines are productive and the fruit holds in storage unusually well. Recommended for commercial planting and is a desirable variety for the home vineyard.

Brighton A reddish grape which ripens a few days ahead of Concord. Produces large bunches of high quality grapes. While its commercial possibilities are limited, it is recommended particularly for the home vineyard. Brighton is self unfruitful and should be planted near other varieties for cross-pollination.

Romulus A sister seedling of Himrod. The clusters are large, compact and the berries small, yellow, seedless, sweet, vinous and good in quality. Like Himrod, Romulus is susceptible to winter injury and should be restricted to the more favorable sites.

Niagara A white grape of high quality with large compact clusters. Would add to attractiveness of display on a roadside stand. Ripens with Concord.

Concord The particular merits of Concord are its adaptability to a wide variety of soils, its productiveness, hardiness, vigor and shipping quality. Concord requires a growing season of approximately 160 days for proper ripening of its crop.

****

Cooperative Extension Service
University of Massachusetts
Amherst, Massachusetts
A. A. Spielman
Director
Cooperative Agricultural Extension Work
Acts of May 8 and June 30, 1914
—
Official Business
431 — 3/68 — 985
Permit No. 1216

Postage and Fees Paid
United States Department of Agriculture

FRUIT NOTES

Prepared by the Department of Plant and Soil Sciences
Cooperative Extension Service
College of Agriculture
University of Massachusetts, Amherst

EDITORS

W. J. LORD AND W. J. BRAMLAGE

MAY–JUNE, 1968

TABLE OF CONTENTS

Issued by the Cooperative Extension Service, A. A. Spielman, Dean and Director, in furtherance of the Acts of May 8 and June 30, 1914; University of Massachusetts, United States Department of Agriculture and County Extension Services cooperating.

CHEMICAL WEED CONTROL IN STRAWBERRIES

Dominic A. Marini
Regional Agricultural Specialist - Southeast Region

Because of potentially high yields and strong demand, strawberries can be a profitable crop. Control of weeds is essential to the attainment of high yields, however, and since a strawberry bed occupies the land for about 16 months, a great deal of hand labor may be required to keep the bed weed-free. Because of the potential return, a greater investment in labor and other inputs can be justified with strawberries than with many other crops. However, where labor is not available, or where there is competition with other crops for labor, herbicides can be used to substantially reduce the high labor requirement of strawberries. It should be noted, though, that even if an herbicide that gave perfect weed control were available, some cultivation would be necessary to keep the soil loose in order for runners to take root.

At the present time, we are recommending two materials for controlling weeds in strawberries, dacthal and diphenamid. Both herbicides must be applied to a weed-free soil since they do not control established weeds. Also, moisture is necessary for best results; 1/2 to 1 inch rain or irrigation is needed within a week after application. Slight injury in the form of distortion or yellowing of older leaves has been observed with both materials. This is temporary, however, and does not appear to affect runner formation or yields.

Dacthal is recommended at the rate of 8 to 12 pounds of the 75 percent commercial product per acre. It remains effective for about six weeks, so several applications are required for season-long control. A late summer or early fall application provides good control of chickweed, a serious problem in most strawberry beds. Dacthal may be applied early in the spring, prior to weed germination, to control weeds in bearing beds.

Dacthal is particularly effective against crabgrass and other annual grasses, and against purslane, chickweed and lambsquarter. It is weak against ragweed and red root pigweed, and poor against galinsoga, smartweed, mustard and other cruciferous weeds. Where galinsoga is a serious problem, use of dacthal is not recommended.

Diphenamid is recommended at the rate of 5 to 7 1/2 pounds of the 80 percent formulation per acre or 8 to 12 pounds of the 50 percent formulation. It controls a wider range of weeds than dacthal and provides longer-lasting control. Shallow incorporation of 1 to 2 inches soil depth improves its effectiveness.

Until recently, diphenamid was labelled for use on strawberries up to 12 months of harvest. With recent changes in registration, it is now permissable to use diphenamid on strawberries up to 60

days before harvest. This means that it can be used in early April on a bed that will be harvested in June. The manufacturer recommends an interval of at least six months between applications.

Recent investigations have shown that a combination of 2 herbicides frequently provides more effective weed control than either material used alone. In some cases the effect is additive, resulting in a wider range of weeds controlled; in other cases the combination controls certain hard-to-kill weeds not controlled by either material alone.

In two years of trials, the combination of diphenamid and sesone (SES) has consistently given the best results of all herbicides and combinations of herbicides tested. Both materials were applied together in the same spray, diphenamid of the rate of 3 pounds of the 80 percent product per acre and sesone at 3 pounds. Another combination, 8 pounds of dacthal plus 4 pounds of sesone produced better results than dacthal alone.

None of the above materials or combinations provides satisfactory control of galinsoga, a very serious weed problem on many farms. Tenoran*, an herbicide recently registered for use on strawberries, is suggested for trial where galinsoga is a problem. In limited trials in 1967, Tenoran appeared promising as a control of this weed. Tenoran may be applied at pre- or early post-emergence; broadleaf weeds should be less than 2 inches in height and grasses less than 1/2 inch in height for post-emergence application. Tenoran is applied at the rate of 8 pounds of 50 percent wettable powder per acre. It may be applied within sixty days of harvest; not more than two applications in any one year are recommended. When used at pre-emergence, rain or irrigation should follow for best results.

*Trade name

****

POMOLOGICAL PARAGRAPHS

Proceedings of Roadside Market Conference: A limited supply is still available of the Proceedings of the New Jersey Roadside Market Conference of February, 1967. The charge per copy is 50 cents and copies may be obtained by writing to Morris Fabian, Extension Specialist in Marketing, College of Agriculture and Environmental Science, Rutgers, New Jersey 08903.

Chemical Weed Control in Red Raspberry Plantings: Although simazine and diuron are labeled for use in raspberry plantings, they are primarily effective in controlling germinating weed seeds. It may take several years use of these herbicides before good control

of established perennial weeds is obtained. Therefore, deep-rooted perennials should be eliminated from the planting before using either diuron or simazine, or else you must depend on the gradual elimination of these weeds by annual applications of these herbicides.

****

GROWING YOUNG APPLE TREES

William J. Lord
Department of Plant and Soil Sciences

The February, 1968, New York State Horticultural Society News Letter contained a supplement with two articles by R.L. Norton, Fruit Agent in Monroe and Orleans Counties on "Growing Young Apple Trees Rapidly" and "Pruning Young Trees for the Future." Of particular interest were the following statements pertaining to growth of trees on various rootstock/scion combinations at 5 locations in Monroe County,New York.

"I expect and get an average of 8 to 10 feet of accumulative terminal growth on apples the first year the trees are set in the orchard on moderate growing varieties. On the stronger growing varieties such as Mutsu, Greening and Wayne, the average total terminal growth is 10 to 12 feet. Trunk growth on McIntosh, for example, on MM 106, has an average measurement of 11 3/4 inches in the fourth growing season; this reflected an average annual growth of 2.8 inches. This typical kind of growth has been obtained each year on hundreds of trees since 1962, without any supplementary watering during the growing season. However, this kind of growth will not be realized on poorly drained soils. Furthermore, my test orchards are located in Western New York, varying from 2 to 20 miles from the shores of Lake Ontario. Possibly other areas have weather, soil or other environmental restrictions which would prohibit such growth response."

The writer is in full agreement with Norton in that we should anc can obtain 10 or more feet of total growth on newly set trees under favorable conditions. In the February, 1963, issue of Fruit Notes, the writer presented the following data (Table 1) from growth measurements made on 15 two-year old McIntosh and 15 one-year old Red Delicious trees on EM VII planted in a grower orchard in 1962. It was mentioned that growth like that shown in the table might well constitute a goal for other Massachusetts growers.

A good orchard soil, thorough preparation of the site, optimum nutrition level and freedom from weed competition are essential in order to obtain growth equivalent to that cited by Norton and the writer. In the orchard where the author obtained the growth

measurements, the land was bulldozed and then limed at the rate of 3 tons per acre. A stone rake was used and then the area was fertilized with 500 lbs. of 10-20-20 applied as a broadcast application. The area was again smoothed with a stone rake and the trees planted. Topsoil that has been bulldozed off the area in the process of clearing the land was used in the planting holes. After planting, 3 or 4 forksfull of cow manure was spread around each tree. A mixture of grass seed and oats was sown. During the summer, oats sown in the spring were cut and raked around the trees for mulch.

Table 1. Growth the Year of Planting of McIntosh and Red Delicious on EM VII, 1962.

Variety	Avg. number of terminals	Avg. inches of growth/terminal	Avg. total growth (inches)
McIntosh	10.9	15.6	170
Red Delicious	6.8	23.6	161

Since the article on "Growing Young Apple Trees" was published in the 1963 issue of Fruit Notes, several recent findings and observations in respect to fertilization, mulching and chemical weed control and plantings on size-controlling rootstocks are of interest. These are discussed below.

Fertilization

In the past, the rule-of-thumb for fertilization of non-bearing apple trees was the application of 1/4 pound of sodium nitrate or its equivalent of nitrogen for each year of age of the tree. For example, a two-year-old tree would receive 1/2 pound (0.08 lb actual N) and a five-year-old 1 1/4 pounds of sodium nitrate (0.20 lb actual N) or its equivalent. It was of interest to read a comment by Dr. Norman Childers in the Autumn, 1967, issue of HORT SCIENCE about fertilizer practices in North Carolina. He stated that North Carolina growers were using 2 pounds of ammonium nitrate per tree (0.67 lb N), hand applied, under 2-year-old Spur Delicious and Golden Delicious. Although North Carolina has much longer growing season than Massachusetts, some of our growers are using half this amount on 2-year-old trees (0.33 lb N) plus mulch and an equivalent amount of N on 4-year-old trees (0.67 lb N). These amounts are far in excess of that if the rule-of-thumb were followed---0.08 lb N as compared to 0.33 lb N under 2-year-old trees and 0.16 lb N as compared to 0.67 lb N under 4-year-old trees. Norton, in his article on growing young trees, stated that his 2-year-old trees in Western New York are fertilized twice in the spring, using each time 1/2 lb of nitrate of soda-potash fertilizer (15-0-14 analysis. This amount is approximately 2 times the rule-of-thumb. It appears, therefore, that in an attempt to grow young trees fast, growers are fertilizing at rates in an excess to the old rule-of-thumb. Since

most of our trees in Massachusetts are in sod and compete to some extent with grass for nitrogen, rates 2 and 3 times that of the rule-of-thumb on non-bearing trees seem reasonable. However, the fertilizer should be applied as early as possible in the spring to help avoid late growth and subsequent winter injury.

Mulching

During the last 2 years, some growers have discontinued the practice of mulching young apple trees in favor of use of herbicides, because of the mouse problem. Since many of our orchards are established in sod, control of vegetation under these trees becomes necessary if optimum growth is to be obtained.

In this respect, we studied the response of 3-year-old McIntosh trees on EM VII to simazine applications, hay and black plastic mulch from April, 1964, to April 1967. Although no differences in tree growth occurred among treatments, hay mulch increased leaf N and potassium, and high leaf potassium was associated with depressed magnesium and calcium. Therefore, under the conditions of this experiment, chemical weed control was a suitable replacement for the sod-mulch system of culture. The data pointed out, however, the necessity of adjusting the fertilizer program to the soil management system being used in order to maintain an optimum level of nutrition.

Whether or not growth of young fruit trees would be improved by chemical weed control, depends upon existing cultural practices, growing conditions and perhaps upon the nutritional status of the tree. When young trees are growing in a well-established sod and N and soil moisture are limiting, chemical weed control may benefit growth. This response is apt to be less as the trees become older.

Herbicides

In the February, 1968, issue of Michigan State Horticultural Society Newsletter, Dr. Jerome Hull, Jr., mentioned that a study at the Efford Station in England revealed that cultivation in a young orchard doubled tree size and yield in comparison to trees grown under grass management. He stated also that researchers at this station are now evaluating a method of maintaining complete control of vegetation under the trees and between the rows with herbicides. Although complete control of vegetation on our New England hillside orchards may not be desirable, this practice may find merit in plantings of 200 or more trees per acre on level sites. Until last spring, no herbicide was recommended for use under apple trees the spring of planting. Paraquat now has label clearance for this use and is more practical and economical than black plastic when weed control by means other than hay mulch is desired. Extreme care in application must be taken since spray contact of new shoots and foliage may result in injury!

Plantings on Size Controlling Rootstocks

Trees on dwarfing rootstocks appear to reflect growing conditions and care more sharply than those on seedling roots. In some orchards, it is evident that tree performance is less than satisfactory and that some blocks of trees have been allowed to bear heavily without first obtaining suitable bearing surface. In Volume 91 of the Proceedings of the American Society for Horticultural Science published in 1967, A.N. Roberts and L.T. Blaney, Oregon State University, had the following statements about the influence of interstocks on growth and flowering of apple trees. "The initial response to EM IX, proportional to its length as an interstock, was earlier and greater flowering. Contrary to the widely held opinion that growth reduction induces flowering, reduction in tree size followed later as a result of heavier cropping." This emphasizes the desirability of growing the young trees rapidly to obtain a large bearing surface before heavy cropping occurs. Once the tree starts bearing, however, it may be necessary to reduce the rate of fertilization to help red color development on fruit and under some conditions to help restrict tree size.

Summary

In the past, bearing trees received first priority for good management practices, and non-bearing trees were apt to be neglected. Since new plantings are the future livelihood of the grower, early heavy fruit production on young trees should be a prime objective. The loss of growth in young orchards due to neglect represents a substantial financial loss to the operators.

****

RESEARCH FROM OTHER AREAS

William J. Lord
Department of Plant and Soil Sciences

Mechanical Harvesting of Strawberries: Some agricultural authorities believe that unless mechanical harvesting of strawberries becomes a reality, in the future fresh berries may become economically unavailable to a large percentage of our population. Therefore, there is considerable interest in the development of a mechanical harvester for this fruit.

Researchers at Iowa State University, Ames, Iowa, are testing a harvester based on the concept of only one harvest. This, of course, requires the selection of varieties with concentrated ripening and of the varieties tested at Iowa State, the most satisfactory have been an unnamed selection (Iowa 22-6014), Surecrop, and Sparkle.

In addition to having fairly concentrated ripening, these varieties possess a brittle peduncle and are reasonably firm, all important factors in mechanical harvesting.

The harvester being tested at the Iowa State Research Station is a self-propelled device, having 16 scoops on a chain drive. As the harvester travels along the row, tines on the rotating scoops strip the berries from the plants as the scoops elevate. The berries are collected in the scoops, the scoops are tripped above a collection box for the berries. Although part of the crop is lost because of fruit immaturity or overmaturity, bruising, and unharvested fruit, the Iowa State researchers are optimistic about the mechanical harvest of this crop.

****

SAVE THIS DATE

The Annual Summer Meeting of the Massachusetts Fruit Growers' Association, in cooperation with the Cooperative Extension Service, will be held at the Horticultural Research Center, Belchertown, on July 17, 1968. One of the features of the meeting will be demonstrations of a self-unloading bulk bin trailer and a granular herbicide applicator.

****

PUBLICATION AVAILABLE

Those persons interested in the production of blueberries, grapes, raspberries and strawberries, may wish to obtain a copy of the new publication *Small Fruit Culture*. This publication discusses topics such as site selection, varieties, planting, soil management, pruning, bird damage and its control, harvesting and marketing.

Copies of the publication are available from your County Extension Office or the Department of Plant and Soil Sciences, French Hall, University of Massachusetts, Amherst, Massachusetts 01002.

****

NEW YORK STATE FRUIT INDUSTRY REVISITED

William J. Lord
Department of Plant and Soil Sciences

During March, 1963, 3 Massachusetts apple growers and the writer visited orchards and packing sheds in the Hudson Valley and Lake Champlain area of New York in search of ideas in fruit growing. In April, 1968, the same areas and many of the same orchards and packing sheds were revisited. The intervening 5 years have produced numerous changes, and those of particular interest are the mechanical hedging and topping of apple trees, use of self-unloading bulk bin trailers, hand-packing of apples from bulk bins, and grower-fabricated bulk bin dumpers. Comments on these developments are as follows.

Mechanical hedging and topping: To reduce or restrict tree size and to reduce cost of pruning, growers are hedging and topping trees mechanically. Crist Brothers, Walden and Leonard Clark, Milton,use a sickle-bar mower while Forrence Brothers, Peru, use a commercial hedger and topper. These growers were in agreement that mechanical pruning is best suited to younger blocks as a method of restricting spread and height once the desired tree size has been obtained. Lowering tall trees drastically by topping was considered undesirable, particularly in the Peru area where winter injury is a problem of much concern.

Detailed cuts with hand tools and/or pneumatic pruners are required to complete the pruning operation. Generally in the year of hedging and/or topping, the follow-up cuts are confined to 1- and 2-year wood. Some shoots and water-sprouts not previously cut by the hedger or topper are headed back, but few are actually removed. Heading back of shoots and watersprouts forces lateral growth and increases the number of growing points. The greater the number of growing points, the easier it is to restrict tree size.

The introduction of mechanical pruning might well have introduced a new term----pruning systems----since it is apparent that a definite pruning cycle involving different procedures may develop. For example, the first year trees may be hedged along the rows, the second year across the rows and the third year all the trees may be topped. Each year follow-up pruning cuts are made. The follow-up pruning may consist of stubbing and thinning cuts for 2 years and saw cuts the third year.

Where mechanical pruning was observed, the trees had at least a third more scaffold limbs than is common in Massachusetts. Since some Massachusetts growers are attempting to restrict tree size by making a few relatively large cuts, it would be of interest to compare the 2 pruning methods. Also, it is possible that apple canker may be increased due to the number of stubs left by mechanical pruning.

Self-unloading bulk bin trailers: Two makes of self-unloading bin trailers, similar in principle, are being used in the Hudson Valley. Our observations convinced us that their use will increase the efficiency of loading bulk bins in the orchard and unloading them at the storage. Basically, the trailers have a frame with rollers that is tilted hydraulically, and forks are attached to the rear of the roller frame. To load the full bulk bins in the orchard, the roller frame is tilted until the forks reach the ground and then they are backed under the bins. The trailer can be loaded 1 at a time or a whole load at once. With 1 make of trailer, the weight of the last bin on the forks holds the bins in place while the roler roller frame is leveled hydraulically with a control on the tractor. To unload at the storage, the roller frame is lifted hydraulically and the bins slide off the frame. No stopping of the trailer is required

Hand packing from bulk bins: Four storages in Peru were hand packing from bulk bins. Each operation was somewhat different, but each grower was attempting to make the operation as efficient as possible. In 3 packing sheds, the bulk bins are set on frames which can be rotated by the packers. The frames may be stationary or on rollers. When the frame is stationary, it is necessary to allow room between the packing station and the bin so that the bulk bin can be turned. As a result, the cartons are farther from the bins. When the frame is on rollers, it can be pushed away from the packing station, the bin turned and then returned to its original location.

When the bulk bin is half empty, it is elevated with a fork-lift, 2 folding arms on the frame are raised and the box is again set on the frame. This procedure keeps the apples always at waist level. Marcel Mulberry, Peru, has modified rolling hydraulic floor jacks, commonly used by auto mechanics, for handling bulk bins. The bins, placed on special skids under which the jacks are positioned, can be pulled by the women into position for packing. With the jack, the packer can also adjust the bins to any convenient height. Since the fork-lift driver can "stock pile" the bins on the skids, it is not necessary for the fork-left truck to be available for hoisting half-full bins or replacing empty bins.

Grower-fabricated bulk bin dumpers: Both Vito Truncali, Marlboro, and Michael Lembo, Modena, have designed and constructed their own bulk bin dumpers. The dumper constructed by Mr. Truncali sets at floor level and can be operated in a room with a 9-foot ceiling. A bin of apples is set on a lift with roller sections in front of the tank. When the bin in the tank is empty, this bin and the full bin are hydraulically lifted simultaneously. The full bin is pushed onto the roller section occupied by the empty bin. The empty box slides onto another roller section where it remains until drained. The empty bin is then turned, pulled onto rails and allowed to slide to the floor.

The dumper constructed by Mr. Lembo has 2 unique features: (1) the bins are tilted into water rather than being submerged; and (2) the dumper handles 2 bins at a time. This commercially available dumper can be operated in a room with an 8-foot ceiling.

Summary

The equipment and procedures described above are those of general interest to Massachusetts fruit growers. Other procedures and equipment of more specialized nature were seen and will be discussed at fruit meetings during the summer.

Growers throughout the United States are constantly developing procedures and adapting equipment in attempts to reduce costs and/or labor. By taking trips to other fruit growing areas, the writer and growers making similar trips are attempting to glean ideas that may be of value to the Massachusetts fruit industry.

****

All pesticides mentioned in this publication are registered and cleared for the suggested use in accordance with Federal and State laws and regulations. Where trade names are used for identification , no product endorsement or discrimination is intended.

WARNING! MOST PESTICIDES ARE POISONOUS. READ AND FOLLOW ALL DIRECTIONS AND SAFETY PRECAUTIONS ON LABELS. HANDLE CAREFULLY AND STORE IN ORIGINAL CONTAINERS OUT OF REACH OF CHILDREN, PETS AND LIVESTOCK. DISPOSE OF EMPTY CONTAINERS RIGHT AWAY, IN A SAFE MANNER AND PLACE. DO NOT CONTAMINATE FORAGE, STREAMS OR PONDS.

Cooperative Extension Service
University of Massachusetts
Amherst, Massachusetts
A. A. Spielman
Director
Cooperative Agricultural Extension Work
Acts of May 8 and June 30, 1914

Official Business
442 - 5 68 - 1000
Permit No. 1216

Postage and Fees Paid
United States Department of Agriculture

DR. WM. J. LORD FN
PLANT & SOIL SCIENCES
FRENCH HALL

01002

FRUIT NOTES

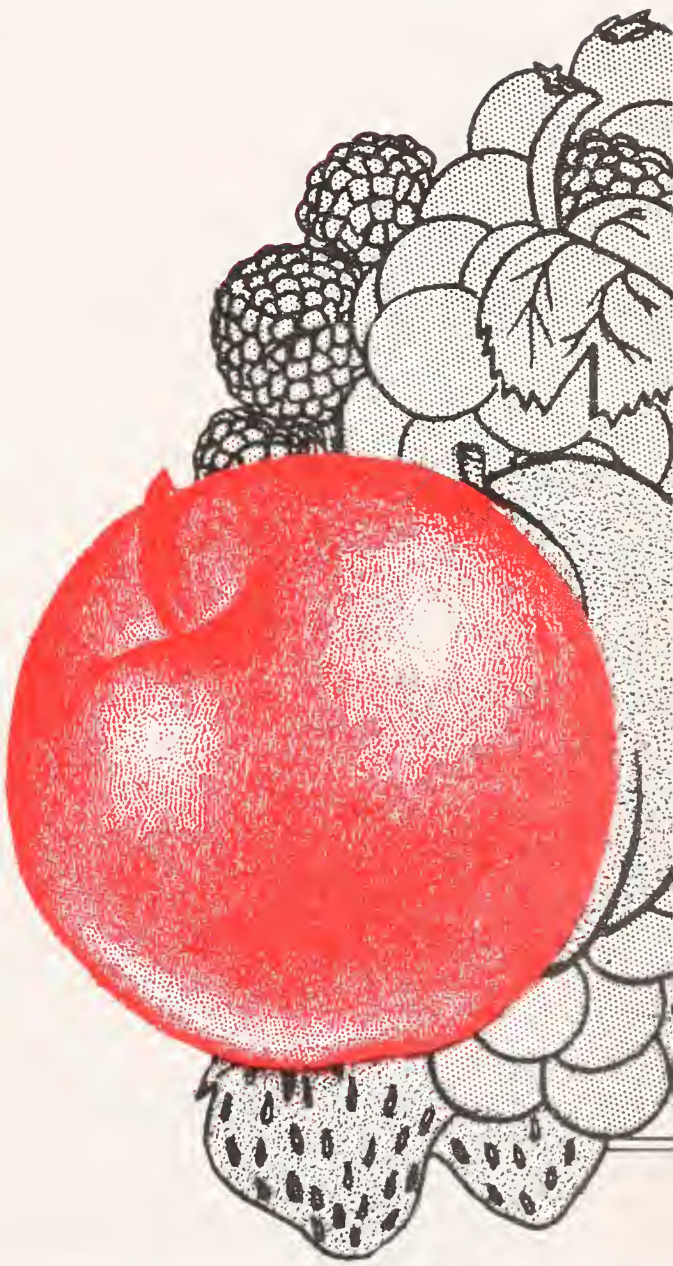
Prepared by the Department of Plant and Soil Sciences
Cooperative Extension Service
College of Agriculture
University of Massachusetts, Amherst

EDITORS

W. J. LORD AND W. J. BRAMLAGE

JULY–AUGUST, 1968

TABLE OF CONTENTS



Issued by the Cooperative Extension Service, A. A. Spielman, Dean and Director, in furtherance of the Acts of May 8 and June 30, 1914; University of Massachusetts, United States Department of Agriculture and County Extension Services cooperating.

THE BEST UNDERSTOCKS FOR NEW ENGLAND ORCHARDS

C. Lyman Calahan, Extension Horticulturist
University of Vermont

Apple growers have clearly proven that they are very much interested in planting young apple trees on size controlling rootstocks. EM VII has been planted more than all of the other size-controlling stocks in this area, but with full knowledge that there are some shortcomings with this stock.

Now a very significant shift from EM VII to MM 106 is occurring, mostly because there is some hope that McIntosh will grow better on this stock. Unfortunately, our experience with growing this newer rootstock in a cool climate and shallow or poor soils is far too limited, leaving us unable to offer meaningful advice to those planting MM 106 rootstocks.

At the University of Vermont Horticultural Research Center, we do have a research project under way to evaluate new rootstocks, but it may be several years before much meaningful data will be available. We selected M-26, MM 104, MM 106 and *M. robusta* 5 as understocks in an effort to run the entire spectrum of size control, vigor and hardiness. The Malling stocks came directly from East Malling as stoolshoots.

McIntosh and Richared Delicious were used as 2 of the scion varieties. A third scion, our own Vermont Spur Delicious, was used to learn more about the growth response of a spur type on the least vigorous and most vigorous stocks used in the experiment. In addition, the variety Mutsu was used, not because it shows much commercial promise, but because it is a very vigorous triploid and is suspected not to be completely winter hardy.

Unfortunately, an experiment of this kind cannot be gotten under way as quickly as we would desire. The trees were finally orchard planted last spring after almost 4 years of "lead time" had elapsed. (Preliminary work was begun in 1963, and the stocks were planted as stoolshoots in the spring of 1965. They were budded that fall and grown at Burlington and Ottawa during the summer of 1966.) Furthermore, it is entirely possible that by the time this orchard is mature, and meaningful data can be obtained, these rootstocks will have become a mere curiosity, passed over by the development of more promising stocks. And even if better rootstocks are not found by then, we may be caught a little shorthanded on 2 or 3 counts when it comes to good research findings to help the grower plan his plantings in the years ahead. First, we won't know for a long time how successfully we will be able to grow McIntosh and Delicious in the hedgerow system, on the more vigorous stocks, by limiting tree size with control pruning. A good economic comparison between such trees and one on dwarfing rootstocks will require a lot of careful work. Secondly, we are rapidly going in the direction of accepting the spur-types in order

to take advantage of their natural dwarfing effect built right into the scion variety. Spur types are already available for Delicious, Golden Delicious, Spartan and McIntosh, the varieties of real interest to New England growers. Experience with the spur types on the size-controlling rootstocks, while not being encouraging, is very limited, and here again, good comparisons will require much work.

Some leading nurserymen are concerned about this problem and are now looking at *M. robusta* 5, *M. robusta* seedlings, and even McIntosh seedlings as understocks for the spur-types. The softwood-cutting method has been perfected for the production of *M. robusta* stocks and it is expected that this stock will be used for some time to come in Eastern Canada. In our plantings at Burlington, we have bearing-age spur-type Delicious on clonal *M. robusta*, and younger trees on *M. robusta* seedlings, and excellent growth of the scion variety has been produced.

Other varieties, including 3 spur-types of McIntosh and 1 of Spartan, are being grown in our plots on *M. robusta* clonal stock. Experience with *M. robusta* seedlings has been limited and there is reluctance to work with them, partly because of the confusion that is certain to follow with clonal *M. robusta*. *M. robusta* seedlings from open pollinated *M. robusta* 5 grown here at our Research Center and those grown by Prof. Ed Rasmussen, (retired) at Durham, New Hampshire, have always been more vigorous than domestic seedlings. At least 1 Canadian nursery and 1 domestic nursery are now trying *M. robusta* seedlings in a limited way.

The suitability of McIntosh seedlings as a stock for the spur-types is well worth investigation. McIntosh seedlings produced here at Burlington proved to be almost as hardy as *M. robusta* 5 clonal stock in laboratory tests. A small planting of Starkrimson Delicious on McIntosh seedlings now starting to bear in Bill Darrow's orchard in Putney, Vermont, has made excellent growth. A Delicious planting on domestic seedlings in Shoreham, is one of the best young bearing-age Delicious plantings in Vermont.

Our Canadian collegues are working with controlled crosses to produce seedlings that will hopefully be size-controlling but still be adapted to a wide range of soil conditions and be cold-hardy. Numerous problems have been solved in the past by using good seedlings and it is certainly possible that new seedling understocks will be available in the future for New England orchards.

****

POMOLOGICAL PARAGRAPHS

Harvest Labor: Securing adequate labor for harvesting is probably the apple industry's greatest problem, and many growers are looking to unusual sources of labor for help. According to Dr. C.S. Bittner, Department of Horticulture, Pennsylvania State University, in the January, 1968 issue of Penn. State Horticultural Reviews, the apple-harvesting labor problem was solved in a unique way last fall by Mr. Alvin Zerby of Ontelaunee Orchards, Leesport, Pennsylvania. A suggestion was made by Mr. Zerby that the local swimming pool association could pay off its debt by having its members pick apples on weekends. Volunteers were organized and earned nearly $4,000 for the association. The idea spread to a nearby rural church whose members earned over $1,000. According to the general manager of the orchard, John Mengel, the idea was satisfactory in all respects, including the condition of the harvested fruit.

****

Why: Why is the lettering so large on the "open" sign and so small on the "closed" sign at many roadside stands? Why do stands advertise "sweet corn" or "fresh strawberries" in the middle of January? Why do stands and cider mills take great pride in neatness only during the season that they are open? Why do some stands fail to display price signs?

****

Clean Tree Bases: Elimination of grass cover around the tree base helps to prevent mouse damage and in the case of peach trees, facilitates better spray coverage for peach borer control. A practical way to eliminate the grass cover around the base of trees is to apply sand or gravel around the base of the trees, and to annually apply herbicides to this area.

****

Blackbird Control: John E. Seubert, Animal Depredation Division, Patuxent Wildlife Research Center, Laurel, Maryland stated at a conference on blackbird depredation that the value of scare techniques for bird control are increased if something occasionally happens to a bird. When the flock does not respond to non-lethal scare devices, the occasional shooting of a bird or treating the population with a chemical frightening-agent will help prevent birds from learning that fakes are being used---Proceedings North American Conference on Blackbird Depredation in Agriculture, Ohio State Cooperative Extension Service Publication.

STRAWBERRY BED FUMIGATION

Walter E. Knox, Jr., Graduate Assistant
Department of Plant Pathology

Several species of nematodes have been reported to cause injury to strawberry plantings; under Massachusetts growing conditions, _Pratylenchus penetrans_, the lesion nematode, appears to be most important. This particular nematode occurs throughout the northeast, and because of its broad host range, which includes many cover crops and a large number of annuals and perennials, it is a potential threat to strawberry growers.

Symptoms of disease caused by _P. penetrans_:

Lesion nematodes have been implicated in the disease complex known as black root rot of strawberry. The whole plant is affected, but first symptoms are visible on the roots. Brown lesions 1 millimeter long appear on the roots, rapidly merging to form a brown to black root system. Often, the outer cylinder of root tissue will slip off, exposing the vascular tissue. Such root damage is usually accompanied by the invasion of bacteria and fungi. Above ground symptoms include generally poor growth of plants, susceptibility to drought, and failure to produce runners.

Control of Black Root Rot:

Control is a two-fold operation. Of primary importance is the selection of strawberry stock substantially free from nematode infection. Such plants will have white roots free from characteristic lesions. All other attempts at control will fail should infected plants be set in the field.

When strawberries are to be grown in soils known to be infested with lesion nematodes, preplant fumigation will reduce disease incidence. Nematicides containing dichloropropenes (D-D, Telone, Vidden-D) or ethylene dibromide (Dowfume W-85) as active ingredients are effective. Vorlex, which contains dichloropropenes and a fumigant, also can be used. The additional ingredient in Vorlex is active against fungi, weeds and soil insects. Nematicides containing 1,2 dibromo-3 chloropropane, such as Nemagon, have not proved effective in controlling _Pratylenchus_ in Massachusetts.

In order to be effective, most fumigants require that the soil temperature be 60°F or above. Therefore, under our growing conditions, August or September is the best time to fumigate.

Since these soil fumigants are toxic to strawberry plants, it is necessary to wait 3 weeks after application before setting the plants. Because of this wait and the necessity for having the soil temperature at 60°F, letting the fumigation go until spring may result in very late setting of plants, especially if the spring is late and cold.

OBSERVATIONS OF FRUIT RESEARCH ACTIVITIES IN ENGLAND

(The following excerpts were taken from an account of Dr. Jerome Hull, Jr.'s observations made during visits to research centers in southern England and published in the February 1968, issue of Michigan State Horticultural Society Newsletter. We believe you will find his observations of interest.---Editors)

"At the Long Ashton Research Station near Bristol, I visited with Dr. Bould. Bould's correlation studies between leaf nitrogen, phosphorus, and potassium with plant vigor, have revealed leaf analysis to be a sound basis for determining the nutrition status of tree fruits and fertilizer needs with little regard to soil type. Bould also found the effect of the nitrogen status at different times of the year very important. He reports that a low nitrogen level in the tree at the time of floral differentiation affects differentiation and that nitrogen shortage later in the season affects embryo longevity and pollen tube growth.

"Dr. Luckwill discussed his studies with growth retardants Alar and CCC. Applications of 2,000 parts per million of Alar restricted vegetative growth and promoted flowering of apple trees. However, such treatments are expensive and Luckwill does not consider them practical where dwarfing rootstocks are available. He believes the chemical would have merit for overcoming excessive vegetative growth and inducing flower bud development. Used in such a manner, only one application would be necessary since the cropping effect in subsequent years would be sufficient to maintain the tree in a fruitful condition.

"Studies with pillar pruning[1] at Long Ashton have not been encouraging. The extensive pruning or cutting necessary with this system encourages excessive vigor. To be successful, pillar pruning probably would be practical only on very poor soils or with very limited rainfall. In general, English growers who have tried pillar pruning have failed because excessive tree vigor has resulted.

"Apple virus investigations at Long Ashton indicate that the health status of the plant interacts with the nutrient uptake at certain stages of development. Viruses have also been observed to reduce the production of stooled cuttings of dwarfing rootstocks. The fungus disease Phythophora catorium has been observed to interact with the viruses killing only infected stock. Likewise, virus-free rootstock has been observed to produce orchards with uniform tree size, while diseased stock did not.

---

[1]Editors' Note---The December, 1962, issue of American Fruit Grower contained an article on the pillar system of pruning. Prof. Arthur Bobb, retired, Extension Horticulturist, University of Connecticut, discussed this system of pruning at several fruit meetings in New England in 1963, following his visit to the European fruit industry. Pillar trees have no main limbs, instead each leader has an assortment of 1-,2-, and 3-year old laterals. The key to the system is the rotation of the 3 different-aged laterals. After the fruiting of the 3-year-old wood, it is removed.

"Most strawberries produced in this area of England are grown under cloches. Cloches are glass coverings placed over the strawberry row to promote early season fruit maturity. Utilizing this very specialized method, growers have been able to produce 3-4 tons of berries per acre and gross $6,000-$9,000 per acre. The average berry price in recent years has been about 84 cents per pound.

"Growers use very limited quantities of nitrogen in their strawberry production. Large quantities of nitrogen result in excessive leaf development but not in increased fruit development, and also result in delayed fruit maturity. They are more interested in growing berries (not leaves) and in obtaining early ripening.

"Studies on root development in a special laboratory at East Malling reveal that fruit trees have two flushes of root growth. The first period of root growth occurs before the period of active vegetative growth, and the second and more extensive root growth period occurs after the vegetative flush of growth. Strawberries planted in March had roots extending to a 4-foot depth by early August.

"A study on light intensity throughout the tree indicates a good correlation between fruit size and light intensity. Fruit size was observed to decrease when fruit was produced more than one yard from the outside periphery of the tree. East Malling scientists have also cut the wood of some large apple trees, separating it into one-, two-, and three-year-old wood. As much as 80 per cent of the wood from some trees was scaffold wood. This would indicate that for very large, older trees, much of the plant's food producing capacity was being diverted to maintaining scaffold wood rather than to maintaining producive fruiting wood."

****

PENNSYLVANIA APPLE INDUSTRY

William J. Lord
Department of Plant and Soil Sciences

C.A. Porter, from Pennsylvania State University, reported in Farm Economics, August, 1967, that apple production should increase in Pennsylvania in the future. Although the total acreage in apples declined 3 per cent between 1964 and 1967, increased tree numbers per acre in young plantings should more than offset this deficit. Crops of 13 to 14 million bushels are predicted by 1970 if weather conditions are as favorable as for the 11 million bushel crops of 1964 and 1965.

The 1967 apple tree survey revealed that 83 per cent of all trees are Delicious, Golden Delicious, York, Rome or Stayman. Jonathan and McIntosh account for an additional 8 per cent of the trees. According to Porter, the two most noteworthy changes regarding vari-

eties, are the increased rate of planting York and the fact that Golden Delicious has overtaken Stayman and is now the third most important variety (based on tree numbers), following Delicious and York.

Approximately two thirds of all apple trees in Pennsylvania are located in 4 counties---Adams, Franklin, Berks and Lehigh. Adams County has the most trees, accounting for 39 per cent of all the apple trees in Pennsylvania.

As in all fruit areas, there are now fewer commercial orchards in Pennsylvania but the holdings are larger than in the past. There are now 168 orchards having at least 2,500 apple trees, and these orchards account for 72 per cent of all apple trees in the state.

****

NORTHEAST MECHANICAL FRUIT HARVESTING DEMONSTRATION DAYS

Thomas E. LaMont, Secretary
New York State Horticultural Society
Albion, New York 14411

The New York State Horticultural Society and the New York State Extension Service are jointly sponsoring a two day show at which mechanical fruit harvesting equipment for tree fruits, vineyards, and berries will be exhibited and demonstrated. This will be held at the Chateau Winery and adjoinging farms two miles east of Lewiston, New York, on Route 104, and about eight miles north of Niagara Falls, on Tuesday and Wednesday, August 13 and 14. Mechanical aids and closely related equipment such as tree toppers and hedgers also will be on display.

This is the first meeting of its kind for fruit growers in the East, and will be of interest to all growers to help them move into this new area of mechanical harvesting. The Perry Apple Harvester, manufactured by C.J. Perry & Son, Gasport, New York, will be shown and demonstrated. This machine will handle cherries and other fruits. The Gould Harvester, manufactured by Gould Bros, of Milpitas, California, will be shown and demonstrated by Harry Smith of Ontario, New York.

For cherries, the Friday and Homelite Harvesters will be shown and demonstrated along with the Ace machine made by Plummer Bros. of Hastings, Michigan. Hydro Coolers, both ice and refrigerator models will also be exhibited.

Both the Gerrans limb shaker and the Shockwave truck shaker will be shown and demonstrated.

Tree toppers will be shown by two local growers. These are heavy-duty mowing machines mounted on fork lifts for changing the height and angle of cut.

An over-the-row harvester for raspberries, blackberries, low bush berries and currants will be shown by the Blueberry Equipment Company of South Haven, Michigan.

Persons wanting booklets on the things to see or a list of motels in the Niagara Falls area should write to the Chamber of Commerce, Niagara Falls, New York 14302.

****

All pesticides mentioned in this publication are registered and cleared for the suggested use in accordance with Federal and State laws and regulations. Where trade names are used for identification, no product endorsement or discrimination is intended.

WARNING! MOST PESTICIDES ARE POISONOUS. READ AND FOLLOW ALL DIRECTIONS AND SAFETY PRECAUTIONS ON LABELS. HANDLE CAREFULLY AND STORE IN ORIGINAL CONTAINERS OUT OF REACH OF CHILDREN, PETS AND LIVESTOCK. DISPOSE OF EMPTY CONTAINERS RIGHT AWAY, IN A SAFE MANNER AND PLACE. DO NOT CONTAMINATE FORAGE, STREAMS OR PONDS.

Cooperative Extension Service
University of Massachusetts
Amherst, Massachusetts
A. A. Spielman
Director
Cooperative Agricultural Extension Work
Acts of May 8 and June 30, 1914
—
Official Business
451 — 7/68 — 985
Permit No. 1216

Postage and Fees Paid
United States Department of Agriculture

FRUIT NOTES

Prepared by the Department of Plant and Soil Sciences
Cooperative Extension Service
College of Agriculture
University of Massachusetts, Amherst

EDITORS

W. J. LORD AND W. J. BRAMLAGE

SEPTEMBER–OCTOBER, 1968

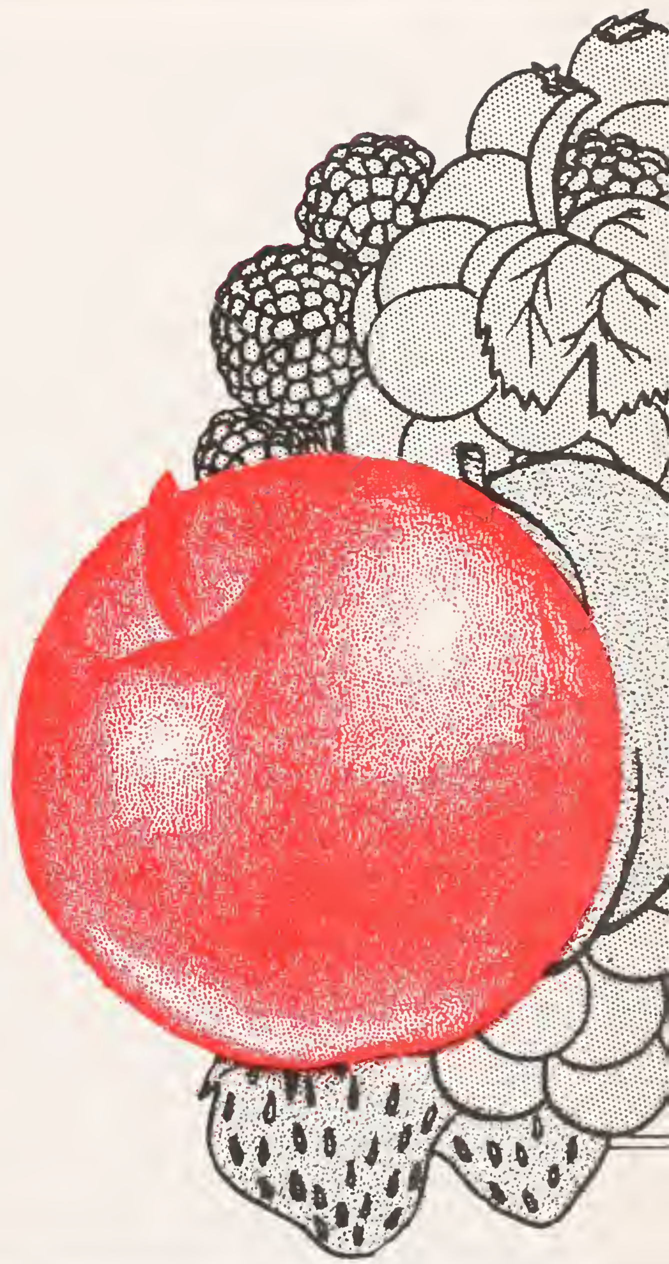


TABLE OF CONTENTS

Issued by the Cooperative Extension Service, A. A. Spielman, Dean and Director, in furtherance of the Acts of May 8 and June 30, 1914; University of Massachusetts, United States Department of Agriculture and County Extension Services cooperating.

IN MEMORIA

Dr. Walter D. Weeks

Dr. Walter D. Weeks, Associate Professor of Pomology in the Department of Plant and Soil Sciences, died on July 25, 1968, after a relatively short illness. Dr. Weeks obtained his B.S. and M.S. degrees at the University of New Hampshire and his Ph.D. at the University of Massachusetts in 1941.

He was a Research Assistant at Rutgers University and an Associate County Agent in Worcester County, Massachusetts, before joining the faculty at the University of Massachusetts, in 1945. During his professional career, he was especially well known for his research on nutrition, clonal rootstocks, vegetative varietal characteristics and the influence of growth regulators on the abscission of apples and other deciduous tree fruits. He published over twenty research articles in books, technical journals and bulletins during his lifetime and was a regular contributor to Fruit Notes.

He was a member of the American Society for Horticultural Science and Sigma Xi. He served as Chairman of the Northeastern Rootstock Conference in 1951 and as a member of the National Committee on the Mineral Nutrition of Horticultural Crops in 1963.

Surviving Dr. Weeks are his wife, Doris, and his son, Paul.

BIRD DAMAGE - WHAT IS IT?

Lloyd A. Mitterling
Plant Science Department
University of Connecticut
Storrs, Connecticut

Abraham Lincoln was credited in 1864 with making the comment, "The world has never had a good definition of the word liberty, and the American people, just now, are much in want of one." That comment aptly defines the American fruit growers' situation regarding bird damage today, except that what we need is not a definition of liberty--we need control of birds!

Our knowledge concerning the control of bird damage is about on a par with the entomologists' knowledge concerning insect control in the 1920's. The pomologists feel inadequately prepared to cope with the problem; the game biologists hasten to explain that the problem does not concern them; and the majority of ornithologists flatly refuse to recognize it. Generally then, we can say that the field is left to anyone who is interested...and, there are few who are.

Effective bird-damage control must be based on the answers to two questions:

1. What is the crop being damaged?
   a. When does the damage occur?
   b. How severe is the damage which does occur?

2. What bird species are responsible for the damage?
   a. Why do they do it?
   b. Where do they do it?

Logically, analysis of damage should start with the crop. It so happens, however, that birds inflict damage to varying degrees and at different times of the year, depending on the locality of the fruit crop. Their aim is to satisfy an innate drive for food and/or moisture. The damage they do depends upon their needs.

Consequently, I believe that our first consideration should be concerned with question 2.b., Where do birds do the damage? This means we must recognize the ecological situations in which damage is occurring. With that knowledge, we can gain valuable clues about why the damage is occurring and which bird species are responsible.

For example: In late March or early April, we notice bud damage on some of our apple trees. If the orchard is located in an isolated area surrounded by shrubs and brushy growth with good cover, then the damage is probably due to grouse or partridge and

they probably fed on the buds for their food value. On the other hand, if the orchard is located in an area which is relatively heavily populated, as many of our southern New England towns are, grouse may not be the culprit. With the increased number of bird feeders in such an area, many bird species may be attracted to that region. If the feeders remain empty for a period during a snow storm or other adverse conditions that create inconveniences for those who feed the birds, some bird species, such as Grosbeak, may turn to bud feeding. Again, the feeding is simply fulfilling an energy vacuum.

During the summer months when the fruit is ripening, the problem as to why the birds feed is somewhat more complex. Thirst may be more of a motivating drive than hunger. Many species may be involved in summer damage, including a number of strictly warm-weather residents, such as the oriole, robin, redwing blackbird and cowbird which migrate south in the winter. (Apparently, some bluejays migrate south, but frequently large proportions of that species remain as year-round residents.) Again, the ecological situation in which the fruit is located may lead to clues concerning the species causing the damage. For example, serious bird damage occurred in 2 blueberry plantings less than a mile apart. The primary culprits in these plantings were different species. In one, surrounded by tall forest and no houses, the damage was inflicted largely by Baltimore orioles. In the other planting, which was surrounded by a residential area, bluejays were a prime feeder.

Much of the damage that occurs in the summer may be related to the fledglings of several species, such as bluejays and orioles. Young fledglings have less fear, are less selective about their food and are almost always hungry or thirsty. There are many factors relating to severity of bird damage, and our records are woefully inadequate when we attempt to measure damage. We are simply unable to accurately assess it at this time. When we have learned to measure damage, the next problem will be: What percentage of the loss should be invested in control measures? If the control costs more than the damage, it obviously won't be feasible. But what percentage of the loss is a feasible investment? This we must decide.

Our knowledge of how to control bird damage is very limited, but we do know that carbide guns and similar noise makers are influential against bluejays and orioles "when properly used." Unfortunately, "proper use" in one situation may not be "proper" in another. Apparently, the abundance of "wild" food in an area is related to the effective use of carbide guns. If there is an abundance of wild food, the guns will deter the birds from the crop much more readily than if there is a limited wild food supply.

Currently, crop protection with various types of netting materials is an extensive type of control being attempted in some areas. These nets are expensive and generally are inefficient protection for such crops as cherries, peaches and apples. Perhaps where bud damage is severe, we'll need a new type of culture sys-

tem for crops such as these, to facilitate protection measures and permit the harvest of an undamaged crop. It could also be true that intensive efforts during the damage-occurrence period may be less expensive than an extensive season-long control measure such as use of netting.

The problem of bird-damage to fruit crops is of growing significance, and it is important that ornithologists become aware of and involved in the problem. They need to recognize that the development of a general ornithocide will be forthcoming if some relief is not soon found for the grower. Furthermore, the grower needs to recognize that while all bird species may be culprits, many may be so only during brief periods of duress. Thus, cooperation between the ornithologists and the fruit growers is essential to a solution of the problem.

****

THINGS TO REMEMBER AS YOU HARVEST APPLES

William J. Bramlage
Department of Plant and Soil Sciences

Harvest time is usually hectic, and with all the problems of weather, labor and equipment it is only too easy to overlook or forget some of the basic principles involved in getting fruit of the best possible quality to the consumer. Consequently, a few reminders on these principles follow.

Pay attention to fruit maturity. Maturity is the stage of development of the fruit at harvest. Fruits are changing rapidly during the harvest season, especially if the weather is hot, and these changes cannot be compensated for after harvest. If harvested at an immature stage, apples will never develop top-quality flavor or color, and they will be highly susceptible to shriveling and scald after harvest. If overmature at harvest, the fruit will be very susceptible to internal breakdown and to storage rots. How do you identify maturity? Many indices can be used, but no quick tests currently used are precise. Pressure tests, color (especially undercolor), abscission and flavor are all helpful, but probably the best guide is your experience with your own fruit. No one needs to tell you the fruit are immature or overmature. There is not much we can do to control maturity, although Alar will give us the best means so far developed. But we need to recognize when fruit are being harvested either immature or overmature and to handle them accordingly. Do not store such fruit. They will not improve in storage; they will only produce problems.

Handle apples as though they were eggs. Eggs break easily and so do apples. A cut or a stem puncture is a wide open door to rot-producing fungi. A bruise harms the appearance and can stimu-

late ripening, since bruises stimulate the production of ethylene gas, the ripening hormone. Unlike maturation, wounding is under our control and we need to preach and to practice gentle handling endlessly.

Don't let water stand on fruit. No fruit will be free of fungus spores. These spores cannot germinate if they are dry, and germinating spores cannot survive if they dry out before they have penetrated the fruit. But fungi grow fast, especially if the fruit are warm. It is a safe bet that if fruit are wet 24 continual hours, infections will occur and rots will develop. Try to avoid loading the storage with wet fruit. And if you must load with wet fruit, then it would be well not to humidfy the storage immediately. Also, if your storage is humid at the time of loading, be careful of condensation as temperature falls. With constant moisture content, relative humidity will increase sharply with falling temperature. For example, 70% R.H. at 50^{o} F will be almost 100% R.H. at 41^{o} F. Fruit should be exposed to no more than 95% R.H. for more than 1 day or decay will result.

Don't let fruit dry out. This is the other side of the coin. Fruit should be exposed to no less than 90% R.H. for any length of time, and the higher the temperature, the more critical this is. They will usually lose 5% of their weight before they will show any shriveling, so you cannot rely on appearance. That 5% of your income has literally evaporated. Golden Delicious, which are so susceptible to water loss because of their poorly developed wax coating, should be stored in unsealed polyethylene bags. Somewhat immature apples of other varieties might well be handled likewise. Every storage should have a good humidity gauge in it. These are readily available and are extremely valuable. One prime cause of moisture loss from fruit is the use of dry wood as boxes or pallets. Dry wood will absorb large quantities of water, and unless boxes and pallets go into storage already nearly saturated or are quickly wetted thoroughly in storage, they will absorb this water from the air and ultimately from the fruit. And if you wait until the fruit are in the boxes to wet them, then you must be concerned with the dangers of water standing on the fruit.

Cool fruit as quickly as possible. At harvest, apples are respiring near peak rates, and temperature has profound effects at this time. Cool them as fast as possible after harvest. Storage life can be quickly lost at this time, and this loss can never be made up. Since pre-cooling methods are seldom used for apples, quick cooling means getting them out of the sun and into the storage as fast as possible, and the use of sufficient refrigeration capacity for a rapid pull-down of temperature.

Store at the proper temperature. It is not enough just to put apples into "cold" storage. The fruit will usually be held for several to many months, and the difference of a degree or two in temperature will significantly affect post-harvest life and quality. As we have reported before, in tests with McIntosh, we

found that at 34.5° the fruits were as soft after 40 days as were ones held at 32° for 90 days. A 50-day difference for 2.5°! Temperature control _is_ important.

****

CHEMICALS TO HELP WITH THE HARVEST

William J. Bramlage
Department of Plant and Soil Sciences

The problems of pre-harvest drop and scald of apples have been greatly reduced with the development of chemical control measures. Most of these measures have become pretty well established. However, the clearance of Alar for use will require some rethinking of control approaches, as there are still many unanswered questions on where Alar fits into the fruit growers' arsenal of chemicals. Meanwhile, a review of current recommendations seems in order.

Drop control: The 2 chemicals recommended for drop-control are naphthaleneacetic acid (NAA) and 2, 4, 5-trichlorophenoxypropionic acid (2,4,5-TP). NAA is recommended for early varieties and McIntosh. It may be applied at 10 or 20 ppm and as 2 sprays about 10 days apart, but should not be applied within 2 days of harvest. 2,4,5-TP is recommended for late varieties, applied once at a concentration of 20 ppm or less. When properly used, NAA will delay drop at least 1 week and 2,4,5-TP will reduce drop for up to 4 weeks.

Do not use these chemicals indiscriminately or too early, for they will hasten ripening though retarding drop. 2,4,5-TP, in particular,hastens ripening of early-maturing varieties considerably, hence the recommendation of NAA for these varieties. Only apply stop-drop sprays if you need them. If you can harvest a large portion of your fruit, especially your CA fruit, before drop becomes serious do not spray this portion, for you will only be reducing their storage life.

For more complete information on Stop-drop recommendations, consult _Special Circular_ No. 254, available from your regional specialist in Massachusetts.

Scald control: Scald is always a danger, as most varieties of apples are susceptible and susceptibility varies greatly from season to season. The 2 most important factors influencing susceptibility are fruit maturity and pre-harvest temperature. The more immature the apples, the worse they are likely to scald. And the warmer the weather just prior to harvest, the worse scald is likely to be.

Two chemicals that usually provide good scald control are diphenylamine (DPA*) and ethoxyquin (Stop-Scald*). We recommend the use of DPA on Cortland, Delicious and CA McIntosh. It may be applied as a pre-harvest spray at 2000 ppm within 36 hours of harvest. (Do not make a repeat application), or as a post-harvest dip at 1000 ppm. Stop-Scald is recommended for Rome, Golden Delicious and Baldwin. It should be applied only as a post-harvest dip at 2700 ppm, and should not be repeated. Neither DPA nor Stop-Scald causes any appreciable ripening of fruit, but both can cause surface burns on fruit if the apples are not drained well after dipping. Also, both chemicals require solution agitation or they will settle out. If properly used, these chemicals will greatly reduce the scald problem; but due to the variations occurring in susceptibility, they do not guarantee scald control.

For further details on use of these chemicals, consult Special Circular No. 277, available from your Massachusetts Regional Specialist.

Fungicides: If apples are dipped for scald control, can a fungicide be incorporated into the solution to reduce storage rots? This question frequently arises, and while we have not tested this usage in Massachusetts, it has been tested by a number of researchers elsewhere. At the 1968 New England Fruit Meetings, Dr. R.H. Daines reported on his tests at Rutgers University. He has found that while some new and uncleared fungicides appear very promising, of the currently available materials, only Captan has given benefit. He found that 2 lbs. of Captan per 100 gallons of water reduced blue mold by about 50%. Dr. R.M. Smock, of Cornell University, has also noted decay reductions with this treatment, but reports that this level of Captan cannot be recommended as it causes excessive residues. Last year, several Massachusetts growers used 1 lb. of Captan (85%) per 100 gal. of water and were satisfied with results. That is the current recommendation being made by Cornell University.

*Trade names.

****

POMOLOGICAL PARAGRAPH

Blight-Resistant Pears: Star, Lee and Mac, 3 fireblight-resistant pear varieties, have been introduced by the New Jersey Agricultural Experiment Station. Mac and Lee are as blight resistant as Kieffer* while Star is less resistant than Kieffer. However, Mac has not been as thoroughly tested as the other two new varieties.

Under conditions in New Jersey, Star ripens about the time of Clapp Favorite, Lee ripens just after Bartlett and Mac is harvested about 2 weeks after Bartlett.---From Horticultural News, New Jersey Horticultural Society, May, 1968.

*(Editors' Note: Fireblight resistance of Kieffer is considered to be moderate.)

ORIGIN OF SOME OLD AND NEW APPLE VARIETIES

William J. Lord
Department of Plant and Soil Sciences

This past winter it was suggested that an article in Fruit Notes on the origin of some old and new apple varieties would be of interest and of value to readers. Apparently, customers occasionally ask the roadside-stand operator about the origin of a variety.

Most of the apple varieties planted in this country originated here, but the history of many is obscure and except for varieties more recently introduced, few came into existence as the product of the plant breeder. Most of the varieties originated as chance seedlings and were discovered and introduced into cultivation by some observer or admirer of the fruit. McIntosh, Delicious, Wealthy, Northern Spy and Baldwin are examples of commercial varieties that originated as such chance seedlings.

The following is a list of some of the apple varieties being sold in Massachusetts and their origin. Where varieties have resulted from a controlled cross between two other varieties, the origin of such varieties is expressed by placing the letter "X" between the parent varieties. For example, the Milton variety is a cross between Yellow Transparent X McIntosh.

<u>Baldwin</u> — A chance seedling in an orchard at Wilmington, Massachusetts. It was propagated and widely introduced in Eastern Massachusetts as early as 1784.

<u>Cortland</u> — Originated from the cross of Ben Davis X McIntosh. The cross was made at Geneva, New York, by the New York State Agricultural Experiment Station, and it was introduced for trial about 1915.

<u>Davey</u> — Open-pollinated seedling of McIntosh. Originating in North Grafton, Massachusetts, in the orchard of S. Lothrop Davenport, it was introduced commercially in 1950.

<u>Delicious</u> — A chance seedling originally distributed under the name Hawkeye, it was discovered in Iowa in 1881.

<u>Early McIntosh</u> — Yellow Transparent X McIntosh. Developed in Geneva, New York, by the New York State Agricultural Experiment Station, it was introduced for trial in 1923.

<u>Golden Delicious</u> — Originating as a chance seedling in West Virginia, it was introduced by Stark Brothers in 1916.

Idared	Jonathan X Wagener. It was developed in Moscow, Idaho, by the Idaho Agricultural Experiment Station and was introduced commercially in 1942.
Lodi	Montgomery X Yellow Transparent. Developed in Geneva, New York, by the New York State Agricultural Experiment Station, it was introduced for trial in 1924.
Macoun	McIntosh X Jersey Black. Another of the varieties developed in Geneva, New York, by the New York State Agricultural Experiment Station, it was introduced for trial in 1923.
McIntosh	Originated as a chance seedling in Dundas County, Ontario, Canada. Propagation of this variety began in about 1870.
Melba	Open-pollinated seedling of McIntosh. It was developed in Ottawa, Ontario, Canada, by the Division of Horticulture, Central Experimental Farm, and was introduced commercially about 1924.
Melrose	Jonathan X Delicious. Originating at the Ohio Agricultural Experiment Station, it was introduced commercially in 1944.
Milton	Yellow Transparent X McIntosh. Originating in Geneva, New York, at the New York State Agricultural Experiment Station, it was introduced for trial in 1923.
Monroe	Jonathan X Rome Beauty. Originated in Geneva, New York, by the New York State Agricultural Experiment Station. It was introduced as a named variety in 1949.
Northern Spy	This variety originated in a seedling orchard at East Bloomfield, New York. In 1852, the American Pomological Society listed it as a new variety of promise.
Puritan	McIntosh X Red Astrachan. It resulted from a cross made by Professor F.C. Sears at the University of Massachusetts about 1929.
Red Astrachan	This is a Russian apple imported by the Massachusetts Horticultural Society in 1835.
Rhode Island Greening	Locality of the origin is not known with certainty, but it probably originated as a seedling in the vicinity of Newport, Rhode Island.
Rome Beauty	This variety originated as a chance seedling in Lawrence County, Ohio, before 1848.
Roxbury Russet	It is thought that this variety originated in Roxbury, Massachusetts, early in the seventeenth century.

Spartan — McIntosh X Yellow Newtown. The cross was made at Summerland, British Columbia, by the Dominion Experimental Station, and the variety was introduced commercially in 1936.

Spencer — McIntosh X Golden Delicious. Originated in Summerland, British Columbia, Canada, by the Dominion Experimental Station. It was introduced commercially in 1959.

Wealthy — This variety orginated in Excelsior, Minnesota, from seed of the Cherry Crab about 1860 planted by Peter M. Gideon.

Wellington — Cortland X Crimson Beauty. Originated in Geneva, New York, by the New York State Agricultural Experiment Station. It was introduced commercially in 1955.

Winter Banana — Originating on a farm near Adamsboro, Cass County, Indiana, about 1876, it was introduced in 1890.

Yellow Transparent — This variety was imported from Russia by the United States Department of Agriculture in 1870.

****

FRUIT COLOR - ITS NATURE AND CHANGES

William J. Bramlage
Department of Plant and Soil Sciences

Color is a critically important component of fruit quality, a major force in attracting or repelling prospective consumers. It is also a component of quality that is constantly changing as fruits ripen, and which consequently finds use as an index of ripeness. Because of its great importance, color warrants our understanding and careful consideration in the handling of fruit.

Color of plant tissues generally results from the interaction of 3 classes of pigments: the chlorophylls, the anthocyanins, and the carotenoids. Let's first consider the nature of these pigments, and then examine the prime factors that influence their development.

The chlorophylls produce the green color in plant tissues. It has been said that these are the most important compounds in nature, for they are the substances that trap energy from the sun, convert it to chemical energy, and allow it to be stored as food. All of man's food, and consequently his very existence, derives from this process. Although green fruits obviously contain chlorophyll and are capable of making food, most of the food in a fruit has been transported in from the leaves, which are much more efficient "food factories" than are fruit.

In an immature fruit, chlorophyll is constantly being broken down and re-made, so that a healthy fruit retains a rich green color. But as a fruit matures, chlorophyll synthesis gradually ceases and the pigment that breaks down is no longer replaced. Thus, a ripening fruit rapidly loses its green color, this change being so characteristic that it can be used as a maturity index.

The anthocyanins are a large family of pigments responsible for most of the red and blue colors in nature. Unlike the chlorophylls, which have a very important physiological function, the anthocyanins appear to function simply in making a structure attractive. Coloration from these pigments is no simple matter. There are usually more than 1 anthocyanin present in a certain kind of fruit. In apples, the same 3 anthocyanins seem to be present in all red varieties, though in different proportions in different varieties. In contrast, at least 14 anthocyanins have been identified in single varieties of blueberries. Since the actual color of the fruit is an interaction of all the pigments present, it's obvious that coloration of blueberries is much more complex than that of apples.

An interesting feature of anthocyanins is that the same pigments may produce a color ranging from pink to red to black to blue to purple, depending on their concentrations and the chemical environment within the cells. A pink fruit will turn red as more anthocyanin is produced. On the other hand, without a change in concentration of any pigment, color can turn from red to blue to purple if the pH of cells rises slightly, that is, if the cells become slightly less acid. This change of acidity changes the structures of the anthocyanins and thus changes the color they produce. Slight changes in acidity in this way may be responsible for some of the color changes during ripening of fruits like plums and blueberries. However, most of the formation of red and blue colors is due to rapid synthesis of new anthocyanins as the fruits ripen. This synthesis accompaning ripening is usually very desirable, but it can go too far, as in the case of the Delicious sports that turn black under New England conditions--they simply form too much pigment.

The third family of pigments is the carotenoids. They produce most of the yellow and orange colors in nature. In addition, one of these pigments (lycopene) produces a red color and is responsible for red and pink colors in some fruits, for example tomatoes, watermelons, and pink grapefruit. Most of the carotenoids function merely as attractants, but one of them (beta carotene) is very important nutritionally, for it is converted into vitamin A.

Most fruits contain only small amounts of carotenoids until they begin to ripen. During ripening, considerable carotenoid synthesis occurs, and this along with the loss of chlorophyll accounts for the yellowing often used as an index of fruit ripening. This synthesis continues until death of the fruit, so intense yellowing often makes a valid index of overmaturity.

There are a number of factors that influence color. Among these are the following:

1. Temperature: High temperature will, of course, cause fruits to ripen faster and thus accelerate the normal changes associated with ripening. But it can also alter these changes. It is know, for example, that above 90° F lycopene (the red carotenoid) will not form, and therefore, a tomato ripened above this temperature will not be red. There is also evidence that high temperatures can interfere with anthocyanin synthesis. On the other hand, relatively low temperatures (40-50° F) accelerate anthocyanin synthesis, resulting in the frequently observed fact that cool weather produces redder fruit.

2. Light: Light is necessary for anthocyanin synthesis in many fruit, including most varieties of apples. Thus, following harvest little reddening occurs except on the few fruits that happen to be exposed to light for an extended period of time. This is not true of all fruits, though. Cranberries, for example, will color in storage in the dark, if they are held at a temperature above 40° F, and even among apples, the variety Beacon is reported to form anthocyanin in the dark. For carotenoid synthesis, light is not necessary except in minute quantities, and as a result yellowing proceeds during storage. There have been some suggestions that supplemental lighting in storages would improve color. But the way fruit are stored, in stacks of boxes, any improvement from lighting would almost certainly be very slight.

3. Sugar content: For synthesis of either anthocyanins or carotenoids to proceed, a tissue must contain a high sugar content. This fact is very important for coloring of leaves and flowers which have much lower sugar contents than fruit, and it is probably the reason why low quality fruit are often poorly colored.

Nutrition: It is well known that high levels of nitrogen can produce poorly colored fruit, since they accentuate chlorophyll and suppress anthocyanin synthesis. It has also sometimes been reported that high potassium and high boron stimulate anthocyanin synthesis, but findings are not consistent with these elements.

Can anything be done about fruit color? Basically, of course, it is controlled by the genetics of the plant. With apples, we are most interested in red color, and our problems have been greatly reduced with the selection of the anthocyanin-rich mutants (red sports) as well as through development of stop-drop sprays which allow the fruit to mature more fully. Yet problems still occur as a result of high temperature, overfertilization, or low sugar content. Once we harvest apples, there is nothing we can do to improve red color except to employ the old process of sun coloring, which is seldom advisable. Considerable research has been conducted to find a means of inducing red color, but to date no method has been found to overcome the requirement for substantial quantities of light in order for anthocyanins to be synthesized. Nevertheless, color does change following harvest, because the loss of

chlorophylls and synthesis of carotenoids proceed in the dark and at low temperatures. These changes are clearly associated with the aging processes in the fruit, and if they are understood, they can be used as an index to fruit quality--used by growers, inspectors and consumers.

****

NEW PUBLICATIONS OF INTEREST

William J. Bramlage
Department of Plant and Soil Sciences

The Canada Department of Agriculture has recently published an easy-to-read handbook on storage requirements of fruit and vegetables. This publication, Handbook on the Storage of Fruits and Vegetables for Farm and Commercial Use, (Canada Dept. of Agriculture Publication 1260, 1967) should be of interest and value to anyone involved in handling these commodities.

The handbook is divided into 4 parts. A general section discusses the storage environment and the general requirements of fresh produce. It also considers certain types of injury to produce. There then follow 2 sections listing specific requirements, including recommended storage temperature and humidity, of a large number of fruits and vegetables. The handbook concludes with an appendix showing how to figure heat loads in storages.

This publication can be obtained by writing to the Information Division, Canada Department of Agriculture, Ottawa, Canada.

Another recent publication that might be of interest is USDA Home and Garden Bulletin No. 141, How to Buy Fresh Fruit.

The bulletin is aimed at the homemaker. It gives tips on selecting produce with an eye for eating quality, makes recommendations on proper handling of fruit at home, and offers suggestions on the best use of certain varieties of fruit.

It might prove quite valuable to be aware of what the homemaker is being urged to watch for-----and to watch out for! This publication may be obtained by writing to the Office of Information, USDA, Washington, D.C. 20250.

****

All pesticides mentioned in this publication are registered and cleared for the suggested use in accordance with Federal and State laws and regulations. Where trade names are used for identification, no product endorsement or discrimination is intended.

WARNING! MOST PESTICIDES ARE POISONOUS. READ AND FOLLOW ALL DIRECTIONS AND SAFETY PRECAUTIONS ON LABELS. HANDLE CAREFULLY AND STORE IN ORIGINAL CONTAINERS OUT OF REACH OF CHILDREN, PETS AND LIVESTOCK. DISPOSE OF EMPTY CONTAINERS RIGHT AWAY, IN A SAFE MANNER AND PLACE. DO NOT CONTAMINATE FORAGE, STREAMS OR PONDS.

Cooperative Extension Service
University of Massachusetts
Amherst, Massachusetts
A. A. Spielman
Director
Cooperative Agricultural Extension Work
Acts of May 8 and June 30, 1914

Official Business
456 — 9/68 — 1000
Permit No. 1216

Postage and Fees Paid
United States Department of Agriculture

FRUIT NOTES

Prepared by the Department of Plant and Soil Sciences
Cooperative Extension Service
College of Agriculture
University of Massachusetts, Amherst

EDITORS

W. J. LORD AND W. J. BRAMLAGE

NOVEMBER – DECEMBER, 1968

TABLE OF CONTENTS

Issued by the Cooperative Extension Service, A. A. Spielman, Dean and Director, in furtherance of the Acts of May 8 and June 30, 1914; University of Massachusetts, United States Department of Agriculture and County Extension Services cooperating.

WE APOLOGIZE

We regret the tardiness of the September-October issue of _Fruit Notes_. The issue went to press the first of August, but due to unavoidable circumstances, it was delayed in the duplication and mailing processes.

NEW ENGLAND FRUIT MEETINGS AND TRADE SHOW

The New England Fruit Meetings and Trade Show will be held at the New Hampshire Highway Hotel, Concord, New Hampshire. The meetings are scheduled for January 8 and 9, 1969.

The hotel is accessible from all major highways. Routes 3 and 93, which lead to Concord, are accessible from anywhere in Massachusetts. Persons coming from Western Massachusetts and Southern Vermont may find the most convenient route to be Routes 9 or 10 to Keene, New Hampshire, and then Routes 9, 202, 89 and 93 to the Highway Hotel.

This year, the new room adjacent to the trade show will be available for the meetings. This room has greater seating capacity than the Banquet Room used in the past.

Below is the tentative program as of October:

Wednesday, Forenoon

10:05 Herbicides -- Application Equipment and Persistence
C.A. Langer, University of New Hampshire
Warren C. Stiles, University of Maine
William J. Lord, University of Massachusetts

10:45 Research Findings on Apple Maggot
Leo Boulanger, University of Maine
Richard Moore, Connecticut Experiment Station, New Haven

11:15 "Measles" of Delicious
Herbert Wave, University of Maine
C.G. Forshey, Cornell University

11:45 M.F.G.A. Annual Business Meeting

Wednesday, Afternoon

1:30 Mechanical Pruning
Cal Plummer, Hastings, Michigan
C.G. Forshey, Cornell University

2:30 Rootstocks and Pruning in Relation to Production
A.D. Crowe, Canada Department of Agriculture, Research Station, Kentville, Nova Scotia

3:00 Latest Research Findings on Pine Mice Control
Howard Tietjen, Bureau of Sport Fisheries and Wildlife, Denver, Colorado

3:45 Recent Trends in Washington State Fruit Industry
William Luce, Yakima, Washington

Wednesday Evening - Banquet

Banquet Speaker: William Luce, Yakima, Washington

Thursday, January 9

9:30 Panel: Organizing the Harvest Operation Using Bulk Boxes
Moderator - C.A. Langer, University of New Hampshire

10:10 The Red Mite Problem
James L. Brann, Jr., Cornell, University

10:40 Estate Planning
George Ecker

11:10 Panel: Orchard Equipment Innovations and Time Savers
Moderator - C. Lyman Calahan, University of Vermont

Thursday Afternoon

1:30 Extending the Harvest Season with Alar
Franklin W. Southwick, University of Massachusetts

1:50 - 3:00 Topics on Marketing and Labor
Speakers to be Announced

****

POMOLOGICAL PARAGRAPH

Herbicides in stone fruit plantings: During the fall of 1967, we applied 4% granular dichlobenil at the recommended dosage with a hand-operated mechanical spreader under our plum, peach and cherry trees at the Horticultural Research Center. Phytotoxicity symptoms this summer were very prevalent on plum leaves. Several cherry trees also exhibited these symptoms, but they were almost nonexistent on peach leaves. Symptoms are tip burn and marginal yellowing of leaves.

We have concluded that the margin of safety between optimum results and phytotoxicity is too small to risk the use of a hand-operated mechanical spreader for distribution of dichlobenil under plum and cherry trees.

****

HYDROCOOLING APPLES

William J. Bramlage
Department of Plant and Soil Sciences

Drs. H.A. Schomer and G.A. Patchen of the U.S. Department of Agriculture, Wenatchee, Washington, recently published a report entitled, "Effects of hydrocooling on the dessert quality and storage life of apples in the Pacific Northwest." In their study, Red Delicious (Starking), Golden Delicious, and Winesap apples were either hydrocooled to a core temperature of 40°F or to 40° at a depth of 1/2" in the fruit, or else air-cooled to a core temperature of 35°F in 3, 7, 14, or 28 days. The apples were all stored at 30-31°F and evaluated for quality and condition at intervals from November to as late as August. Quality evaluations included firmness, soluble solids, acidity, and the use of a taste panel.

The tests showed that the hydrocooled fruit and the fruit that were air-cooled in 3 or 7 days were comparable in quality and storage life expectancy. However, those fruit requiring 14 or 28 days for cooling to 35° were inferior, especially the Red Delicious which became unfit for consumption. It is interesting to relate these findings to an earlier report by Dr. Blanpied in New York (Proc. Amer. Soc. Hort. Sci. 70:58-66). In comparing hydrocooled McIntosh to ones air-cooled in 3 days or in 1,2 or 3 weeks, Blanpied found clear differences in favor of hydrocooling during the first 3 months of storage, but after 4-5 months storage, hydrocooled fruit were comparable to those air-cooled in 3 or 7 days.

The results of these tests indicate that for long-term storage of apples, hydrocooling offers no advantage to the fruit over air-cooling, unless the fruit cannot be cooled within a week by air. However, it should be noted that the use of hydrocooling can considerably reduce the requirements for refrigeration capacity in the storage, since "pull-down" requires much more capacity than is needed for temperature maintenance.

The publication by Schomer and Patchen (ARS 51-24) can be obtained free from the Office of Information, USDA, Washinton, D.C. 20250.

****

LET'S AVOID A TRAGEDY!

Ellsworth H. Wheeler
Professor of Entomology
Leader, Pesticide Chemicals Program

Young children are poisoned by pesticides more frequently than any other age group. Improper storage of pesticides and unsafe dis-

posal of "empty" containers are major causes. Youngsters are curious and they get from "here to there" before anyone knows it.

If your children, or anyone's children, can get to your pesticides or "empty" containers there is something wrong---something that is YOUR responsibility to correct.

Check these suggestions---is your place tragedy proof?

1. Store all pesticides (and other hazardous materials) in original, plainly labeled containers.

2. Have one place for pesticides---one which can be locked! (Another spot may be needed for products spoiled by freezing). A shed, garage, or other open area is not a safe place to keep pesticides. Opened packages increase the danger.

3. A separate, well-marked building is best. Second best would be an enclosed corner or end of a structure in which no animals are housed---no people either.

4. Never leave pesticides outside the locked storage even though you may be planning to use them again tomorrow.

5. Pesticides and "empties" left unattended in the open at the mixing-filling station are an invitation to tragedy in this day when farms are not so isolated from non-farm families and children roam more freely.

6. A ditch, stream bank or an open dump anywhere is NOT a safe place to throw "empty" pesticide containers.

7. Burn "empties", that will burn, in a spot where ashes can be buried; this amount of heat does not destroy some pesticides. And remember, smoke from organo phosphates is especially dangerous.

8. Bury bottles and metal containers 18 inches or deeper under compacted soil at a spot where, in so far as possible, you have determined there is no chance of later exposure or that waters can be polluted. It is best to break bottles and to puncture and/or crush cans and drums, but, do it in the hole or so that surface soil is not contaminated. Avoid splashing with the concentrate!

Remember! Accidents with pesticides don't just happen---somebody lets them happen---someone who didn't "measure up" to his responsibility.

****

FACTORS CONTRIBUTING TO LOW TEMPERATURE INJURY IN STRAWBERRIES

Bertie R. Boyce
Department of Plant and Soil Science
Vermont Agricultural Experiment Station
University of Vermont

Winter injury occurring in strawberry plants can be a serious problem in northern regions. The degree of injury may range from none, to that severe enough so the plants do not survive. Internal crown discoloration is often used in the field as an indication of the degree of injury: the darker the crown tissue, the more severe the injury. Our experiments have indicated that enough injury can occur to reduce yields without discoloring the crown tissue. Moderate injury can go undetected and yet reduce berry size or number and thus total yield. This may be the cause of relatively low yields that cannot be attributed to other factors.

How much injury occurs and how vigorous the plants will be the following spring, depend upon many factors. These factors can be divided into three groups: (1) conditions that determine how much resistance to low temperature injury the crowns will attain; (2) conditions that bring about injury; and (3) conditions to which the plants are subjected following injury. Most of the strawberry hardiness research at Vermont has dealt with the first two groups.

How much resistance to low temperatures will be attained differs with varieties. We have screened many varieties under artificial freezing conditions and found a wide range among them. Catskill and Sparkle were among the hardier varieties tested, while Earlidawn was among the least hardy. Nutrition, soil moisture, and fall temperatures all play a role in determining how hardy the plants will become. If mulched too early, the degree of hardiness attained will be substantially less. Periodic sampling and artificial freezing indicate that maximum hardiness is not reached until mid-November in the Burlington area.

A strawberry plant, after reaching its maximum hardiness, is still not a hardy plant. Tissue temperatures low enough to kill strawberry plants would not injure peach buds. If the crown temperatures approach 20°F, injury will probably be severe enough to reduce yields. If the crown temperatures reach 10°F, the plants are unlikely to survive.

In controlled freezing tests, rapid freezing and thawing increased crown injury. This probably is not a factor under field conditions because close proximity to the soil and a covering of mulch usually prevent rapid freezing or thawing.

The amount of injury increases as the time the tissue remains frozen increases. This could be significant at temperatures above that where the plant is killed, but within the temperature range

where plant injury occurs. Under laboratory conditions, crown injury increased over a 5-day period within the temperature range of 24°F to 12°F. Although the amount of injury increased throughout the freezing period, it was most rapid during the first day. Thermocouples in crowns of field plants here have recorded temperatures of 20°F or lower for periods longer than 5 days.

Repeated freezing and thawing under controlled conditions significantly increased crown injury compared to plants frozen only once. The more often they were frozen, the more injury resulted. Increased injury of this nature on field plants may be more of a problem in early spring than during the winter. Crown temperature recordings have indicated that during the winter, plants covered with mulch or snow seldom thaw out. But in the early spring, crowns frequently freeze and thaw, especially on unmulched plants.

Each spring injury may be more of a problem than is commonly recognized. Hardened strawberry plants placed under ideal growing conditions began to lose their hardiness within two days. After a week, they had lost an appreciable amount of resistance. If this occurs under field conditions, the plants would be subject to injury during early spring at temperatures that would be of little concern in the winter.

Mulching plants in the fall of the year is presently the only practical means of reducing the chances of low temperature injury. A straw mulch minimizes the adverse effects of many of the above factors. Continuous snow cover offers by far the best protection; unfortunately,it cannot be depended on. Six inches of snow will keep crown temperatures above the point of injury when air temperatures drop to -20°F. Snow fences or other means of accumulating snow over the plants may help reduce injury, especially when low temperatures follow a mid-winter thaw before additional snow cover occurs.

Once the tissues are injured, the growing conditions the following season will influence the vigor, yield, and even survival of the plants. With a specific amount of injury, plants growing under optimum conditions will have a better chance than under adverse conditions.

****

PUBLICATION AVAILABLE: Available from New York State Agricultural Experiment Station, Geneva, New York, is Bulletin No. 817, entitled "Propagating Fruit Trees in New York." In this publication, the following topics are discussed: (1) appropriate rootstocks for use with various species and varieties of deciduous fruit trees; (2) methods for growing rootstocks from seeds; (3) propagation of clonal rootstocks by means of stooling beds and cuttings; and (4) budding and grafting techniques.

RESEARCH FROM OTHER AREAS

William J. Lord
Department of Plant and Soil Sciences

Hedge Pruning of Fruit Trees: The effects of mower pruning on the growth and production of fruit trees in Michigan were studied by C.M. Hansen, R.P. Larsen and G. Monroe and reported in Volume 50 (No. 3), of the Quarterly Bulletin of the Michigan Agricultural Experiment Station, Michigan State University, East Lansing, Michigan.

The study showed that top hedging with a sickle bar-type mower plus follow-up pruning by hand reduced labor and was satisfactory for continuing growth and productivity of peach trees.

Conventional hand pruning required 15 minutes per tree. Top hedging followed by finish hand pruning reduced time to 12 minutes per tree. When top hedging was followed by a minimum of hand pruning, which consisted of only major cuts to eliminate broken and undesirable branches, the pruning could be accomplished in 3 or 4 minutes per tree.

Hedging alone stimulated excessive top growth and the lower interior branches were shaded out after 2 or 3 years. The type of fruit wood produced by hedge pruning also was greatly inferior to that produced by conventional pruning. However, 3 or 4 large pruning cuts each year, to keep the lower areas open to sunlight, maintained the growth and productiveness of the entire tree.

Yield comparisons of conventional hand pruning, top hedging plus hand finish pruning, top hedging plus minimum hand pruning, top hedging only, and top and side hedging, showed no significant differences among pruning treatments during 4 of the 5 years of evaluation (1960-64).

In 1962, trees which received top and side hedging had significantly higher yields than those receiving the other pruning treatments. This difference did not hold for subsequent years, however, and there was no significant difference in the overall average yields for the 5 years. No data for fruit size was obtained and this possible effect of pruning treatments needs further evaluation.

The hedge pruning results with cherries and apples were somewhat similar to those with peaches. There were no significant differences in cherry yields during the two years in which data were obtained. Pruning labor for cherries was reduced somewhat, but not as much as with peaches. The effect of hedge pruning on apple trees was difficult to evaluate since the trees were not grown in a hedge row, but the implication was that there were no apparent effect on yield.

The authors concluded that since other cultural practices, such as fruit thinning, are so closely related to pruning, a great deal

of further evaluation is needed before hedge pruning could be generally recommended to Michigan fruit growers. They were of the opinion, however, that careful hedging followed by needed hand pruning might result in substantial labor savings to fruit growers.

****

CIDER NOTES

Kirby M. Hayes
Department of Food Science and Technology

Chemicals may be used to preserve cider for a few days or weeks. Potassium sorbate, a relatively tasteless material, is preferred instead of benzoate of soda and is just as effective. Benzoate of soda imparts a burning taste that many people find objectionable.

Add potassium sorbate to the cider as soon as possible after pressing. If the cider is to be stored at room temperature (70^{o}F), add 0.10% by weight of potassium sorbate, the maximum permitted by law. Thus, 1 gallon of 25% solution of potassium sorbate would be sufficient for 250 gallons of cider, or 1 ounce for 2 gallons. Because potassium sorbate is only slightly soluble in cider, add it to the cider slowly and stir vigorously.

Mild refrigeration (50^{o}F or below) greatly increases the effectiveness of potassium sorbate. At this temperature, 0.05% of the solution preserves cider for several weeks.

****

POMOLOGICAL PARAGRAPH

Delicious Sports: In an address presented at the January, 1968, annual meeting of the Virginia State Horticultural Society, James Ballard, Yakima County Extension Agent, Yakima, Washington, stated that some brokers have indicated buyer preference for the striped Red Delicious. Most of the new super red sports become too dark in color, for example Starkrimson, Top Red, Hi Early, Chelan Red, Wellspur, Earlistripe, Imperial, Red Spur and Oregon Spur. Ballard cited Red Prince, Red Queen and Improved Red King as examples of prominent striped Delicious.

In a personal communication with Mr. Ballard, he stated that the Bisbee (Starkrimson) strain has contributed heavily to the problem of dark Delicious, since large plantings of this strain now are coming into full production.

FRUIT NOTES INDEX FOR 1968

(This index of major articles has been prepared for those who keep a file of Fruit Notes. The numbers in parentheses indicate the Pages on which the item appears.)

January-February

March-April

May-June

July-August

September-October

November-December

****

Cooperative Extension Service
University of Massachusetts
Amherst, Massachusetts
A. A. Spielman
Director
Cooperative Agricultural Extension Work
Acts of May 8 and June 30, 1914
—
Official Business
462 — 11/68 — 1,000
Permit No. 1216

Postage and Fees Paid
United States Department of Agriculture

FRUIT NOTES

Prepared by the Department of Plant and Soil Sciences
Cooperative Extension Service
College of Agriculture
University of Massachusetts, Amherst

EDITORS

W. J. LORD AND W. J. BRAMLAGE

JANUARY–FEBRUARY 1969

TABLE OF CONTENTS

Issued by the Cooperative Extension Service, A. A. Spielman, Dean and Director, in furtherance of the Acts of May 8 and June 30, 1914; University of Massachusetts, United States Department of Agriculture and County Extension Services cooperating.

VARIETIES OF RASPBERRIES AND BLACKBERRIES FOR MASSACHUSETTS

James F. Anderson
Department of Plant and Soil Sciences

Raspberry Varieties

Variety	Type	Recommended for	Harvest Season
September	Red	C & H	Early
Taylor	"	C (limited)	Midseason
Latham	"	C	Midseason
Milton	"	C & H	Late
Fallred	"	H	Everbearer
September	"	H	Everbearer
Clyde	Purple	T	Late
Bristol	Black	T	Midseason

T - Trial H - Home garden
C - Commercial-Varieties so marked are not equally adapted to all sections of the state.

Variety Notes

September An everbearing type. The summer crop ripens in early July. The fruit of September is of good size, attractive, bright red, reasonably firm and of fair to good quality. The plants are very productive, easily picked and satisfactorily winter hardy. The fall crop begins ripening in late August.

Taylor This variety is being grown successfully on a commercial scale in the higher elevations of Franklin and Worcester Counties. Under such conditions, the plants are tall, vigorous, hardy and productive, and the berries, large, firm, attractive and have good quality. However, its susceptibility to and severe injury from virus diseases makes it unreliable in most other areas of the state.

Latham The fruit of this popular variety is of good size, bright red, but only average in firmness and quality. The plant is vigorous and one of the most winter hardy when spur blight is controlled. Susceptibility to spur blight and mosaic are its most serious weaknesses.

Milton The fruit of this variety ripens slightly after Latham. The berries are of good size, bright red color and very good quality. The plants are tall, vigorous, productive, remain free from mosaic, but are somewhat susceptible to leaf curl. Milton is only moderately winter hardy.

Fallred — The fall crop of this everbearing variety begins ripening in mid-August. The berries are of good size, firm and have good flavor. The plants are vigorous and productive. Fallred is best grown for the fall crop only.

Clyde — A large fruited purple raspberry. The berries are attractive, firm, tart and good in quality. The plants are very vigorous, hardy and productive. Clyde is most suitable for culinary use.

Bristol — Black raspberries are not generally satisfactory in Massachusetts because of their great susceptibility to virus diseases. Bristol is one of the more desirable varieties. It produces large attractive, firm berries of good quality. The plants are vigorous and productive as long as they remain free from virus diseases.

Blackberry Varieties

Darrow — This new early ripening blackberry variety is recommended for trial. The plants are hardy, vigorous and productive. The berries are large, firm, attractive and have good flavor.

Bailey — This variety ripens a little later than Darrow. The plants are hardy, moderately vigorous and productive. The berries are moderately firm, attractive and have good flavor.

Trailing types, such as Boysenberry, Loganberry and Youngberry are not sufficiently winter hardy and productive in most parts of the state. However, the Boysenberry has been reported as reasonably satisfactory in a few locations.

****

RECENT SMALL FRUIT INTRODUCTIONS

James F. Anderson
Department of Plant and Soil Sciences

The following report briefly describes some of the recent small fruit introductions that might be of interest to both commercial growers and backyard gardeners.

Strawberries:

Raritan — A new midseason strawberry variety was named and introduced by the New Jersey Agricultural Experiment Station in February, 1968.

Raritan was fruited in our trials in 1962, 1967 and 1968. This variety produces very attractive fruit having a high gloss, bright red color, depressed yellow achenes and a large showy calyx. The berry size was variable, ranging from large to medium. The fruit is firm, has good flesh color and a very good strawberry flavor.

The plants produce runners freely and make a good matted row. Yield records in 1962 and 1967, would suggest Raritan to be a productive variety (Yield records were not obtained for Raritan in 1968).

Raritan is not resistant to red stele or verticillium wilt and is recommended for trial only in fields free of these disorders.

Redchief

This midseason strawberry variety was released in February, 1968, by the Maryland Agricultural Experiment Station and the Crops Research Division of the U.S.D.A. Redchief was included in our variety trials for 1965, 1966, 1967 and 1968.

The fruit is attractive with a medium red color, bright gloss, large reflexed calyx and is above medium in size. The berries are firm, have good internal color and good dessert quality.

The plants are of moderate vigor and produce runners in sufficient quantities to make a good matted row. Redchief has yielded very well in our past trials usually among the top three or four producers.

Redchief is resistant to 5 races of red stele-root rot and intermediate in resistance to verticillium and would be of value where these disorders are present. Redchief appears worthy of trial.

Blueberry:

Bluetta

A new blueberry variety released by the Crops Research Division of the U.S.D.A. and the New Jersey Agricultural Experiment Station in December, 1967.

The plants of Bluetta are short, compact-spreading and medium in vigor. The fruit is medium-sized, light blue in color, firm but has broad stem scars. The fruit is said to have more flavor than Weymouth and to be more resistant to spring frosts than Weymouth. Its outstanding features are early ripening and consistent production. The above notes are based on performance of the variety in New Jersey as the plants at the Horticultural Research Center are too young for satisfactory evaluation.

Red Raspberries: The Maryland Agricultural Experiment Station has introduced a number of new raspberry varieties that may be of value in Massachusetts. None of the varieties listed has been tested in our plantings, but they are being mentioned because of their reported resistence to injury from fluctuating winter temperatures, a factor of some importance in Massachusetts. These descriptions are based on their performance in Maryland.

Reveille	A very early ripening variety, Reveille resembles Sunrise and is of the same season. It is much larger, has excellent color and quality. It is too soft for commercial use, but its size and earliness makes it excellent for home or roadside sales.
Sentry	An early midseason variety, the berries are firm, medium red in color and high in quality. Resembles Taylor. This variety has greater resistance to injury from fluctuating winter temperatures.
Scepter	Resembles September with the fall crop being ten days earlier. The spring crop is midseason. The berries are large, medium red and moderately soft. It is very vigorous.
Citadel	A large midseason variety, very large, very firm and dark red. It may pick with difficulty under some conditions. It is extremely vigorous and highly resisant to leaf-spot diseases.

The above four raspberry varieties and most of those listed on pages 1 and 2 of this issue are available in limited quantities as "Registered Stock" or "Foundation Stock."

****

PMOLOGICAL PARAGRAPH

Alar and the N Dilemma: Our "hind-sight" is always better than our "foresight" when it comes to regulating the nitrogen (N) level of our McIntosh trees. After analysis of leaves sampled in July, we can always inform you whether or not the N level of your trees is within the desirable range. In many instances, the analysis merely confirms your own observations. But the fertilizer has already been applied and it is too late to make corrections for the current season.

Trees excessively high in nitrogen have greater pre-harvest drop, have softer fruit and poorer fruit color. Many growers have blocks of McIntosh that consistently bear large, soft, striped apples that drop excessively. Alar will be of great benefit in these blocks and other blocks of trees excessively high in N, since this growth retardant helps to counteract the effects of high N.

EFFECTS OF NITROGEN AND POTASSIUM ON RUSSET OF GOLDEN DELICIOUS: A PROGRESS REPORT

Mack Drake, John H. Baker and James F. Anderson
Department of Plant and Soil Sciences

A nitrogen and potassium fertilizer study was begun in a 10-year-old Golden Delicious block in 1964, in cooperation with J.A. Davis and Sons, Sterling Junction, Massachusetts. Before treatments were initiated, leaf analysis and trunk circumference were used in selecting and grouping trees. Nine treatments were established, consisting of 3 levels of applied nitrogen with 3 levels of applied potassium in 6 replications. Results to date are as follows.

Initially, leaf nitrogen and potassium were relatively high. After 4 years of treatment, low,medium and high ranges of leaf nitrogen and potassium are developing (Table 1), but a greater spread between low and high is desired.

Table 1. Leaf nitrogen and potassium (% dry weight) as influenced by annual applications of nitrogen and potassium fertilizer.

	%N			%K	
	1965	1967		1965	1967
N_1	2.00	1.97	K_1	1.58	1.78
N_2	2.06	2.02	K_2	1.66	1.88
N_3	2.19	2.23	K_3	1.65	2.00

Time is required to produce a wide spread in leaf analysis, especially in this case where we started with trees growing on well fertilized soil. The leaf nitrogen spread between low and high nitrogen treatments was about 9.5% (2.00-2.19) in 1965 and 13% (1.97-2.23) in 1967. The leaf potassium spread was about 4% (1.58-1.65) in 1965 and 12% (1.78-2.00) in 1967. Thus, the spread between low and high leaf nitrogen and potassium is increasing with time. We estimate that about 4 additional years of treatment are needed to establish the desired range in leaf nitrogen and potassium for correlation with fruit quality. Nevertheless, some differences in fruit quality are beginning to appear among the treatments.

Russet: In 1966, the late Dr. W.D. Weeks observed a trend in russeting among the treatments and this was confirmed in 1968. A random sample of 30 apples from each tree was scored for russet in November, 1966, by Dr. Weeks and in November 1968, by James F. Anderson. Each apple was scored as light, medium or severe in russet, based on area covered and severity of roughness.

Correlation between increased leaf nitrogen and severity of russet was positive in both 1966 and 1968. For each increase of 0.1% in leaf nitrogen in the year preceding the crop, russet increased 5.8% in 1966 and 4.1% in 1968. The preliminary data suggest that russet of Golden Delicious becomes objectionable when leaf nitrogen is increased above 2.0%. As seen in Table 1, the N_1 (or untreated) level was 2.00 in 1965 and 1.97 in 1967.

Correlation between increased leaf potassium and russet was negative. For each increase in leaf potassium of 0.1% for the year preceding the crop, russet decreased 1% in 1966 and 2.3% in 1968. The preliminary results indicate that at about 1.9% potassium, moderate increases in leaf potassium should reduce russet and that decreases below 1.9% potassium should produce increased russet. In this orchard, the K_1 level was 1.58 in 1965 and 1.78 in 1967.

Much of this russeting was of the smooth net-like condition. Based on the United States Standards for Apples, the allowances for smooth net-like russeting are as follows: Extra Fancy, up to 5% of the surface; Fancy, up to 15% of the surface; No. 1, up to 25% of the surface; Utility, up to 100% of the surface. Thus, an increase in russeting might result in a reduction in grade in addition to losses in eye-appeal and storage life.

Color: In both 1966 and 1968, increasing leaf nitrogen above 2.0% reduced the per cent yellow color. In contrast, increasing leaf potassium above 1.9% slightly increased the per cent yellow color.

This preliminary report may serve as a guide for growers of Golden Delicious who have submitted leaf samples for chemical analysis. Russet is likely to increase and yellow color decrease if leaf nitrogen is increased above 2.0%. Russet may be decreased and yellow color increased by increasing potassium above 1.9%.

****

A LOOK AT THE VARIETY McINTOSH

C. Lyman Calahan, Extension Horticulturist
University of Vermont

Not too very long ago, we frequently heard McIntosh producers talking about the need for another good variety to follow or to replace McIntosh. You all know the reasons--McIntosh tends to mature all at once at harvest, it is subject to severe pre-harvest drop, the fruit condition is poor after mid-winter, and even scab control is a problem.

Times have changed and now it has been some time since anyone suggested the need of a new variety to replace part of our McIntosh

production. Indeed, in the future, it may not be possible to produce too many good McIntosh. What has brought about this change in outlook?

The first approach to solving one of the inherent weaknesses of McIntosh was the initiation almost 25 years ago of an elaborate and complex apple breeding program to develop a scab-resistant strain of McIntosh. This project is still in existence and an extensive planting of scab-resistant selections is now nearing production in southern Quebec.

The genetic approach to solving the scab problem with McIntosh has been understandably slow. In the meantime, several solutions to other inherent weaknesses of McIntosh have materialized and these developments are of great value both to the grower and consumer. Pre-harvest drop control materials made possible significant reductions of fruit losses at harvest. Then came CA storage in which McIntosh may be kept in a firm condition for 6 to 9 months and occasionally longer. The cell carton made possible the marketing of oversize or ripe fruit with the minimum of loss. Scab control, although difficult and expensive, is almost perfect and little, if any, of our commercial crop is lost to scab. Now, Alar is showing great promise as a means of solving the drop problem and extending the Mac harvest season. Just what the impact of this material on Mac production will be is not easy to determine. It could mean even a higher percentage of trees of this variety in new plantings than ever before.

What then can we expect of McIntosh? It is already a very old variety, according to one report the original tree escaped the scythe in 1796 and lived for 112 years. Supposedly, McIntosh first came to New England at Newport Center, Vermont in about 1869. So, this variety is already more than 170 years old.

How long will it be the most important variety in our area? The question cannot be answered easily. Lack of cold hardiness ruined the Baldwin when it was almost 200 years old! The Rhode Island Greening lasted almost 250 years as an important variety. Northern Spy dates back to about 1800 and is going out of the scene fast. All this makes Delicious a relative youngster, because it only dates back to about 1880. New McIntosh plantings in recent years almost guarantees that consumers will be getting this fine apple for at least another fifty years, if not longer.

It looks like the McIntosh trees you plant next spring will be a safe bet.

****

Cooperative Extension Service
University of Massachusetts
Amherst, Massachusetts
A. A. Spielman
Director
Cooperative Agricultural Extension Work
Acts of May 8 and June 30, 1914
—
Official Business
468 — 1/69 — 980
Permit No. 1216

Postage and Fees Paid
United States Department of Agriculture

FRUIT NOTES

Prepared by the Department of Plant and Soil Sciences
Cooperative Extension Service
College of Agriculture
University of Massachusetts, Amherst

EDITORS

W. J. LORD AND W. J. BRAMLAGE

MARCH—APRIL 1969

TABLE OF CONTENTS

Issued by the Cooperative Extension Service, A. A. Spielman, Dean and Director, in furtherance of the Acts of May 8 and June 30, 1914; University of Massachusetts, United States Department of Agriculture and County Extension Services cooperating.

PROGRAM PLANNING FOR THE NEW ENGLAND FRUIT MEETINGS OF 1970

As in past years, the presidents of each horticultural or pomological society in New England and the Extension Fruit Specialists from each of these states are members of the Program Committee for the 1970 New England Fruit Meetings. The committee will meet in mid-June to discuss the program for these meetings. Members of the committee welcome suggestions from you regarding possible topics and speakers. If you have any suggestions, now is the time to express them for consideration by your committee.

WHAT'S NEW WITH CA STORAGE

William J. Bramlage
Department of Plant and Soil Sciences

A National Controlled Atmosphere Research Conference was sponsored at Michigan State University by the M.S.U Department of Horticulture on January 27-28, 1969. This conference was attended by CA research personnel from throughout the U.S. and from many other countries, and the participants discussed current information and thinking on all aspects of CA storage. The conference very successfully up-dated information on CA storage, and it was the author's privilege to participate in it. A resume of the conference proceedings is presented here.

The conference was divided into 6 sessions, and one of these sessions dealt with construction of CA storages. R.M. Smock (Cornell) discussed methods tried in New York and pointed out many important observations. He noted that moisture accumulation in the walls is a critical problem--as a result of it the wooden structures of many rooms have rotted. He has never found moisture problems in the ceiling of rooms with well-ventilated attic spaces (in which case the exterior vapor seal should be omitted). He feels that flat roofs on a CA storage present a moisture-accumulation hazard and should be avoided. In the walls, wood should be kept to a minimum, he believes, and where used, it should be redwood or pressure-treated timber. He has observed a number of rooms that have a ventilated space running between the exterior wall and the insulation, with the exterior vapor seal left off, and he has seen no moisture problems in these walls.

Dr. Smock noted that while rooms have been successfully built with no gas seal in the floor, there have been enough failures that it would be better to install floor gas seals. For wall gas seals, he personally favors 28 gauge galvanized iron sheeting. However, sprayed-on polyurethane is working very well, and he believes that it is approaching a competitive level in cost and should be given very serious consideration as a gas seal.

J.W. Zahradnik (Massachusetts) discussed the use of polyvinylchloride as an external gas seal, and pointed out that when properly applied it works excellently. He discussed an engineered concept of CA construction that has been used and which has resulted in a structure largely built by farm labor during the winter; this storage cost $2.02 per box to construct in 1967, in contrast to a comparable structure built for $2.20 per box in 1957. Dr. Zahradnik also noted that he feels a floor seal is very important, and that he favors the use of wood in the structural framework wherever possible to reduce costs.

H.C. Dostal (Purdue) presented a movie showing construction of an experimental Styrofoam-dome CA storage at Purdue. This dome took 5 men 12 hours to construct, and has immense structural strength.

This storage has not yet been tested, but it will certainly bear watching.

Another session of the conference dealt with atmosphere regulation. The highlight of this session was a paper by Bernard Gautier, from Rhone-Poulenc Company, Paris, France. Mr. Gautier discussed the use of large polyethylene bags with silicone-covered windows in them. These bags can be placed over pallets of fruit and sealed, and the atmosphere in the bags will be determined by the size of the silicone surface. The silicone regulates diffusion of O_2 and CO_2 into and out of the bags. The size of the window that would be used would depend on the temperature, variety, atmosphere desired, etc. These bags are rather expensive but can be used for at least 4 seasons, and are being used commercially in France.

The use of these bags has certain advantages and disadvantages. Advantages include the facts that you can have CA without gas-tight rooms; that the rooms can be opened at any time and individual pallets can be removed; and that there is no human danger involved in entering the room. Mr. Gautier also argued that the method was 25% cheaper than conventional CA.

Disadvantages include the facts that it takes about 20 days for atmospheric equilibrium to be established in the bags (although once established, it is said to be very stable); that individual bags cannot be checked each day; and that it is not easy to make compensations for incorrect atmospheres.

Mr. Gautier also noted that whole rooms can be regulated by using large silicone diffusers for gas exchangers. Using this method, volatiles from the fruits diffuse out, but you cannot get CO_2 below 3%.

It seems likely that use of these bags will be tried in the U.S. in the coming years, and it will be very interesting to see how well they work under our conditions, and to see what are the relative economics of their use.

A third session considered in-transit modified atmospheres. This is a booming field, and several aspects were considered. J.R. Harvey (USDA, California) discussed air shipments of produce, where refrigeration is lacking and where modified atmospheres are doing much to protect the produce. Commodities that will withstand high concentrations of CO_2 (such as strawberries) are often placed in sealed units containing dry ice, whereas others sensitive to CO_2 (which includes most commodities) are placed in sealed units and liquid nitrogen is added. Air transit of produce is expanding rapidly, and atmospheric modification during air transit is attaining wide usage.

R.E. Woodruff (United Fruit Company) pointed out that bananas respond excellently to CA (1% O_2, 1-5% CO_2), but that banana boats are not equipped for CA. The current practice is to put the

bananas in large polyethylene bags, evacuate the bags and seal them for shipment. Inadequate control of the atmosphere results in some fermentation due to exhaustion of O_2, but the overall benefits have been sizeable.

T.G. White (Oxytrol Division) and J.R. Lugg (Trans-Fresh Corporation) discussed their companies' commercial units for atmospheric modification of truck and rail units. Mr. Lugg noted that over 6,000 transportation units (trucks and railroad cars) are now equipped for atmospheric modification, and this number will soon increase by 50%. This equipment is used for both transcontinental and overseas shipments. It is apparent that much of the produce coming from the West Coast is already being carried under modified atmospheres, and that the proportion will rise rapidly.

An interesting point noted in this session is that the Tectrol Division of Whirlpool Corporation is no longer making generators for CA storages. Their patents have been sold to a Japanese company, and it is anticipated that this company will, in the not-too-distant future, begin to produce generators. The Trans-Fresh Corporation is, however, an outgrowth from Tectrol and it builds generators, but solely for transit vehicles.

A half day of the conference was devoted to discussion of commercial CA requirements and recommendations for various crops. Numerous researchers presented findings which added up to the following. Of the many commodities that have been tested, only apples, pears, and bananas are established as being highly responsive to CA. For apples, 3% O_2 and 2.5-5% CO_2 (depending on variety) are recommended. For pears, 1% O_2 and 5% CO_2 are recommended for fruits harvested at an early (and desired) maturity. Ones harvested at a late maturity are very susceptible to internal browning when exposed to CO_2, so they should be held at 1% O_2 and 0% CO_2.

F.M. Isenberg (Cornell) presented his results on storage of cabbage, which show that cabbage responds very well to 1% O_2 and 5% CO_2. However, wide variation in response existed among hybrids, and at Cornell they are currently selecting genetic lines which respond well to CA.

R.E. Anderson (USDA, Maryland) reported that peaches and nectarines could be stored with some benefit under 1% O_2 and 5% CO_2, but that storage time was limited to 6 weeks for peaches and 9 weeks for nectarines.

Tests with such crops as grapes, citrus, tropical fruits, potatoes, sweetpotatoes, tomatoes, sweet corn, and cantaloupes, as well as with numerous kinds of flowers, have resulted in no commercial recommendations due to poor or highly variable results. A preliminary and very cautious recommendation of 2% O_2 and 20% CO_2 was made for strawberries by G.J. Stadelbacher (Maryland), but this must be considered as a preliminary recommendation. It is apparent that only a limited number of commodities are suitable for CA storage, at least with current CA techniques.

The final session of the conference considered the physiological effects of CA storage on produce. Among the points noted were these. M. Uota (USDA, California) showed that for flowers, 10 or 20% CO_2 suppressed ethylene production, and that even when returned to air, the flowers produced very little ethylene. Flowers kept under high CO_2 were much more resistant to disease than ones kept in air. G.D. Blanpied (Cornell) showed conclusively that a large accumulation of ethylene in CA storages does stimulate ripening of apples. This has particular pertinence to rooms being controlled by a recirculating generator. Care should be taken to ensure that the generator is purging ethylene as well as CO_2. G.J. Stadelbacher (Maryland) presented data indicating that much of the benefit from high CO_2 on strawberries may actually be due to accumulation of certain volatiles (other than ethylene) under these conditions, which would suggest that complete purging of volatiles would be undesirable.

To summarize this conference, it is apparent that there is world-wide interest in expanding the benefits now being obtained from CA storage. It can be argued that many of the findings in other areas are not applicable to our own situations and problems, but if one is to evaluate current trends and gamble on future developments, he needs to know just what is happening. CA is clearly a large part of the future of produce handling around the world, and periodic conferences like this one are needed to coordinate information and ideas on the subject.

****

POMOLOGICAL PARAGRAPH

Nitrogen level of McIntosh apple trees in 1968: Nitrogen (N) is a difficult nutrient to regulate in fruit trees. It has been stated that all nutrients except N can vary over a considerable range without harmful effects on tree performance or crop quality. In practically every orchard sampled in 1968, the N levels were within the desirable range for bearing McIntosh trees (1.80-2.00 percent on a dry weight basis). To the contrary, in 1967, leaves sampled from 29 bearing McIntosh blocks in Massachusetts and southern New Hampshire showed that the N level in these blocks averaged 2.3 percent which is in excess of the N levels conducive to good red color development. We were fortunate that the hot weather during the 1968 harvest season was not confounded with excessively high N levels.

****

HERBICIDE TOXICITY AND HAZARDS

E.H. Wheeler
Professor of Entomology
Leader, Pesticide Chemicals Program

(Adapted from article by Dr. J.E. Dewey, in Cornell Newsletter, Volume 4 (No. 10), December, 1968).

Many users of herbicides have not realized that herbicides are pesticides and that they can be highly toxic. Many users treat herbicides as though they were no more toxic than drinking water. Because of this total disregard for possible toxicity, many needless accidents have occurred.

Even materials like 2,4-D and 2,4,5-T are not free from hazard, as well illustrated by deaths resulting from the ingestion of commercial formulations and sickness following inhalation and excessive contact as reported by the National Clearinghouse for Poison Control Centers.

The importance of the hazards of herbicides is further supported by the 1966 report on "Occupational Diseases in California Attributed to Pesticides and Other Agricultural Chemicals" by the California Department of Public Health, Bureau of Occupational Health. They report that of the 1,347 accident reports received in 1966, organic phosphate insecticides accounted for 19% of the cases followed by herbicides at 11%, fertilizers at 10% and halogenated hydrocarbon insecticides at 7%. The fact that herbicides are second only to phosphate insecticides in causing accidents should clinch the matter of their potential hazard.

PARAQUAT and DIQUAT - Delayed Effect!

As a further illustration of the hazards of herbicides, consider Paraquat and Diquat. These materials have been widely used and handled with reckless abandon. The oral LD_{50} to rats is 150 and 400 mg/kg respectively. Other things being equal, these levels would be considered only moderately toxic. Unfortunately, in the case of these materials, other things do not appear to be equal. Based on cases in which these materials have been taken orally by accident, extremely small quantities taken into the lungs have triggered an unknown lung deterioration. Once this action is initiated, it appears that death is almost certain and that there is no known antidote. Death may result in a few days , a week, or 2 or 3 weeks, depending on the dose.

From a practical point of view this means that care should be taken not to breathe the mist of these sprays. Breathing the mist or drift is believed to be more serious than low level ingestion. Masks should be worn to remove droplets and particulate matter from the air inhaled. Drift may be more a hazard to others than to

the applicator and should be considered. The vapor pressure of both materials is low and the vapors are not believed to be of a significant practical hazard.

These materials may also offer a hazard to the eyes. A farmer in England splashed some diquat-paraquat-surfactant into his eye. He washed the eye. A mild irritation occurred for the next 3 days. A week later he was hospitalized and suffered severe damage to the eye. Thus, care should be taken to avoid splashing of the eyes--goggles, safety glasses, or a face shield should be worn.

The present labels for these materials bear a "WARNING" statement "DO NOT INHALE", "DO NOT GET ON SKIN", "DO NOT TAKE INTERNALLY." Observation of the use of the material does not indicate that the hazards are realized or the warning followed.

When using a pesticide--any pesticide--handle it as a highly toxic material--avoid becoming a statistic.

****

RANDOM THOUGHTS ON CHEMICAL WEED CONTROL IN ORCHARDS

William J. Lord
Department of Plant and Soil Sciences

It is now possible to chemically control a broad spectrum of weeds, prevent the influx of weeds tolerant to some herbicides and to apply an herbicide whenever it is convenient. However, phytotoxicity to young fruit trees because of excessive dosages of herbicides continues to be a problem in some orchards. The injury is generally the result of over-dosage when hand-held spray guns and mechanical spreaders are used. Occasionally, herbicide drift or direct spray contact on tree foliage and fruit is a problem encountered with tractor-mounted spray booms. To minimize this difficulty, use a coarse spray and avoid applications during windy conditions. The boom should be mounted in front of the driver, so that he can make boom adjustments more easily.

Paraquat

Paraquat is worthy of consideration by growers having past difficulties with herbicide injury. This herbicide becomes inactive on contact with soil and therefore presents no problem of residue. However, at least one repeat application during the summer will be necessary for season-long weed control. Since soil moisture is generally more limiting in the late summer than during May and June, the best timing for the repeat application of paraquat, in order to enhance trunk growth and fruit size, and to control annual weeds, is mid-July and later.

Those growers who like the quick "knock-down" of weeds with paraquat, but wish to avoid the necessity of a repeat application during the year, could apply a mixture of paraquat plus simazine or diuron. The spray mixture should keep the treated area relatively free of weeds during the growing season.

Herbicides in Stone Fruit Plantings

The margin of safety between herbicide tolerance and toxicity is less for stone fruits than for apples. There are several reasons for this. Stone fruits are frequently planted on lighter soils with less organic matter content, and organic matter is known to reduce toxicity of herbicides considerably. Furthermore, they are apt to be cultivated rather than mulched. Mulch is a source of organic matter and consequently adsorbs herbicides. Finally, they are inherently more susceptible to herbicides than are pome fruits.

Although the writer has successfully used several herbicides in peach orchards, the exact amount applied was known. In the hands of some applicators, paraquat may be the only safe herbicide to use in peach orchards because of their tendency to apply excessive dosages.

Growers who are currently cultivating their peaches might consider the use of an herbicide and the discontinuation of this practice. An herbicide program may be more economical and our studies show that tree performance should be equivalent to that obtained from cultivation.

Dichlobenil

Growers like the convenience of the late-fall application of dichlobenil but occasionally they desire a spring application of this herbicide. This is particularly true when early snows prevent late-fall or early-winter applications. Dichlobenil is highly volatile and may persist only a few days on the soil surface unless applied when temperatures are low, therefore, applications to be effective must be applied in early spring. In limited trials, we have found that applications of dichlobenil in the 3rd or 4th week of March are as effective as applications the previous November. Weed control ratings in 1968 showed, however, greater effectiveness of the 150-lb than of the 100-lb rate of application of dichlobenil in March (Table 1). Both rates in November were equally effective.

Table 1. Effectiveness of November and March applications of 4% granular dichlobenil for the control of weeds.

Application rate (lbs commercial product)	Percent weed control mid-August, 1968, resulting from applications:		
	Nov. 1, 1967	Nov. 15, 1967	March 21, 1967
100	88	79	59
150	85	90	84

Terbacil

Terbacil, the herbicide most recently labeled for use in orchards, may be used under non-bearing and bearing apple and peach trees that have been established 3 or more years. Contrary to other herbicides terbacil is less toxic to peach than apple trees. Our experience with this herbicide is very limited but experience both in Maine and Massachusetts indicates that its use should be avoided on light soils with low organic matter content.

Summary

If used properly, herbicides are a useful tool in orchards. Our 1969 recommendations for orchard weed control can be obtained from your County Agent in early spring. Read the recommendations carefully and prior to application read the label on the herbicide container for further information.

****

EXTENSION STUDIES PLANNED FOR 1969

William J. Lord
Department of Plant and Soil Sciences

Extension studies have served as a teaching method and have provided suggestions and answers for increasing the efficiency of fruit production. Frequently, they have been a cooperative effort of two or more members of the Department of Plant and Soil Sciences or conducted in cooperation with other departments of the College of Agriculture. During 1969, extension studies will continue to constitute an integral part of our Fruit Extension Program. To keep growers informed of what studies are anticipated, they are listed below with the names of the individuals responsible for these activities.

I. Evaluation of Waxing of Apples

   A. Purpose: Determine the response of Delicious and McIntosh apples to waxing before storage.

   B. Method: A study will be conducted during the 1968-69 storage season. Apples will be waxed in a commercial packing line at harvest time, and effects on their post-harvest life will be evaluated. Delicious will be evaluated directly after waxing and after post-waxing air storage. Evaluation will include weight loss, appearance change, watercore loss and internal breakdown development. McIntosh will be evaluated directly after waxing and after post-waxing air storage; the evaluations will include weight loss, appearance change and development of brown core.

C. Faculty: W.J. Bramlage and Michael R. Shipway (Graduate Research Assistant), Department of Plant and Soil Sciences.

II. Evaluation of Alar, A Growth Regulator for Apple Trees

A. Purpose: Determine the response of Delicious apple trees to annual applications of Alar.

B. Method: Two studies will be continued during 1969, one of which was initiated in 1965, and the other in 1968. One set of Delicious trees will receive their fifth consecutive annual application of Alar applied either in July or August at the rates of 1000, 2000 or 4000 ppm. Other trees will receive their second consecutive annual application of Alar at the rates of 500 or 1000 ppm in mid-June or mid-July. The effect of the Alar treatments on tree growth, fruit size, fruit flesh firmness, repeat bloom and the occurrence of watercore and internal breakdown will be determined.

C. Faculty: W.J. Lord, Department of Plant and Soil Sciences

III. Chemical Weed Control

A. Purpose: To evaluate the performance of new herbicides under Massachusetts conditions and to determine herbicide persistence in soil, and the response of fruit crops to herbicides.

B. Method: Initiate or continue studies to determine:

1. Tree response of Jerseyland peach trees to annual applications of simazine and simazine plus paraquat mixture (initiated in 1966).

2. Simazine residues in soil and mulch under McIntosh apple trees receiving annual applications of this herbicide (initiated in 1964).

3. The concentration of simazine in soil that is toxic to apple trees (initiated in 1968).

4. The response of Delicious and McIntosh apple trees and Earli-Red-Fre and Richhaven peach trees to annual applications of dichlobenil (initiated in 1965).

5. Effect of simazine on microorganism population in orchard soil (initiated in 1968).

C. Faculty: Regional Fruit Specialists - D.A. Marini and G.E. Wilder; W.J. Lord and H.B. Gunner, Professor of Soil Microbiology.

POMOLOGICAL PARAGRAPH

Peach Leaf Color in Fall and Nitrogen Level: In a peach orchard at the Horticultural Research Center having 3 levels of nitrogen (N), the effect of N on leaf coloration and leaf drop in the late fall is very striking. The higher the N level, the greener was the foliage, and the lower the N level, the earlier was the leaf drop. With great accuracy, one could select the low, medium and high N trees. Growers might profitably use fall leaf coloration of peach trees of the same variety, as a guide to fertilization the coming spring. Trees apparently low in N could be marked with paint as an indication that extra fertilizer is needed for the coming year. This is feasible since many growers fertilize on an individual tree basis rather than appying a broadcast application.

****

All pesticides mentioned in this publication are registered and cleared for the suggested use in accordance with Federal and State laws and regulations. Where trade names are used for identification no product endorsement or discrimination is intended.

WARNING! MOST PESTICIDES ARE POISONOUS. READ AND FOLLOW ALL DIRECTIONS AND SAFETY PRECAUTIONS ON LABELS. HANDLE CAREFULLY AND STORE IN ORIGINAL CONTAINERS OUT OF REACH OF CHILDREN, PETS AND LIVESTOCK. DISPOSE OF EMPTY CONTAINERS RIGHT AWAY, IN A SAFE MANNER AND PLACE. DO NOT CONTAMINATE FORAGE, STREAMS OR PONDS.

Cooperative Extension Service
University of Massachusetts
Amherst, Massachusetts
A. A. Spielman
Cooperative Agricultural Extension Work
Acts of May 8 and June 30, 1914

Official Business
470 – 3/69 – 980
Permit No. 1216

Postage and Fees Paid
United States Department of Agriculture

FRUIT NOTES

Prepared by the Department of Plant and Soil Sciences
Cooperative Extension Service
College of Agriculture
University of Massachusetts, Amherst

EDITORS

W. J. LORD AND W. J. BRAMLAGE

MAY–JUNE 1969

TABLE OF CONTENTS

Issued by the Cooperative Extension Service, A. A. Spielman, Dean and Director, in furtherance of the Acts of May 8 and June 30, 1914; University of Massachusetts, United States Department of Agriculture and County Extension Services cooperating.

STRAWBERRY WEED CONTROL

Dominic A. Marini
Regional Fruit & Vegetable Specialist
Southeast Region

Since a strawberry bed occupies the soil for about 16 months, controlling weeds is an important consideration in producing a crop. Herbicides, properly used, can be an economical substitute for scarce and increasingly expensive labor in combating weeds. A few growers have managed to eliminate hand hoeing, but most have found that they must supplement herbicides with some hoeing. Complete elimination of cultivation of strawberries is not desirable, since the soil must be kept loose and open to facilitate rooting of runners.

Herbicides must be properly used to be effective. Most materials recommended for strawberries are pre-emergence herbicides; they kill germinating seeds but are not effective on established weeds. As such, they must be applied within 2 or 3 days after planting or cultivation. No strawberry herbicide is effective in dry soil; rain or irrigation within a few days of application is a necessity. Weed population also has a bearing on choice of materials since not all herbicides are equally effective in controlling a particular weed. Finally, good equipment, properly calibrated to deliver the recommended amount of material uniformly to a measured area, is necessary for successful weed control.

The following materials are recommended for weed control in strawberries for 1969: Dacthal* (DCPA); diphenamid (Dymid*, Enide*), Sesone*, and Tenoran* (chloroxuron). None gives full-season control. The latest trend in weed control is the use of herbicide combinations. Sesone* is recommended only in combination with either Dacthal* or diphenamid. Better control of a broader range of weeds results when these materials are combined than when used separately. During the past 2 seasons, the combination of diphenamid and Sesone* has consistently given us the best results of all treatments in trials conducted in Southeastern Massachusetts.

In 1968, the price of Dacthal* was reduced considerably resulting in its increased use. One grower made 3 applications durthe season and eliminated hoeing of strawberries on his farm. It is most effective for the control of crabgrass, purslane, chickweed and lamb's quarters, while it is not effective on Galinsoga and is weak on ragweed and smartweed.

Regulations governing the use of diphenamid were changed during 1968. It is now permissible to apply this herbicide within 60 days of harvest. Plants should be established about 3 weeks before application and a period of 6 months should elapse before another application is made.

Tenoran* was cleared for use on strawberries in 1968. It is the only herbicide recommended for both pre-and post-emergence use on strawberries. For post-emergence use, the smaller the weeds the better the results; broadleaved weeds should be less than 2 inches in height while annual grasses should be less than one-half inch in height. In 1968 trials, pre-emergence treatments were more effective than post-emergence treatments, particularly for annual grass control. Tenoran* has promise as a control for Galinsoga, a serious problem on many farms. Plants should be established before application and not more than 2 treatments may be made in 1 year.

For complete details on dosage rates and application instructions, refer to your 1969 Chemical Weed Control Recommendations for Small Fruits and the manufacturer's directions on the label. Read the label and observe all application directions and safety precautions.

*TRADE NAME

****

POMOLOGICAL PARAGRAPH

New Edition of "Modern Fruit Science" is Now Available: Many fruit growers are familiar with the book on orchard and small fruit culture written by Dr. Norman F. Childers, Rutgers University, entitled "Modern Fruit Science." A new 1969 edition of this book is now available from Horticultural Publications, Rutgers University, New Brunswick, New Jersey 08903.

Anyone looking for an up-to-date reference book on fruit culture should find "Modern Fruit Science" of value. Dr. Childers estimates that approximately 30 per cent of the book is new. He has given emphasis to (a) compact fruit trees, (b) chemical weed control in fruit crops, (c) mechanical harvesting and pruning, (d) soil management, (e) chemical thinning, (f) pest control, (g) production trends and (h) economics of growing and marketing of each crop. The appendix contains, among other things, suggestions for management of labor and for dealing with labor unions, and also suggestions for securing maximum allowable tax deductions.

****

THE RETURN OF THE MARMOTA MONAX

Edward R. Ladd, Wildlife Biologist
Bureau of Sport Fisheries and Wildlife
DIVISION OF WILDLIFE SERVICES
University of Massachusetts

The Marmota monax, better known as woodchuck or groundhog, is a source of fable as well as nuisance to the farmer. In fable, the popular belief is that if the groundhog sees its shadow on Groundhog Day, February 2, it will return to it's burrow and winter will continue for 6 weeks longer. The animal's accuracy as a weather prophet has been disputed.

However, the damage caused by this nuisance animal is real. In the early spring when it comes out of hibernation, its claws are long and its incisor teeth have grown considerably. The animal sharpens its claws and wears down its teeth on nearby trees, shrubs, buildings or fence posts. The clawing and gnawing, especially on trees in orchards, causes wounds which eventually may kill a tree.

The woodchuck is a hearty feeder and lives almost entirely on green succulent plants. It is this foraging on market garden crops and backyard gardens that creates complaints; and calls for control measures arise.

The most efficient and humane way to control the woodchuck whenever it becomes a nuisance is to gas its burrow. The U.S. Fish and Wildlife Service developed a Gas Cartridge some years ago which still produces the best results.

The Gas Cartridge does not work perfectly every time for everyone, even though the Pocatello Supply Depot has attempted to provide a trouble-free item. Last year when the new red fuse was introduced, some difficulty was experienced in that it did not always ignite the gas cartridge. In 1968, a change in fuse types was necessary when the former manufacturer became totally occupied with military contracts.

Information on the shortcoming of the new red fuse was passed on to the supply depot and it went to work to locate a better fuse. It has located a manufacturer of one that supposedly will be identical to the brown fuse---the one that produced almost trouble-free results.

Cooperators having gas cartridges on hand with faulty fuses may wish to write to the Wildlife Services Fund, University of Massachusetts, Old Conservation Building, Amherst, Massachusetts 01002, and request a supply of replacement fuses for which there will be no charge.

Gas Cartridges must not be used in woodchuck burrows that are located under buildings or near buildings because of the fire haz-

ard. Also, extreme care must be exercised when using the gas cartridge during extremely dry weather. Information is available on the trapping of woodchucks by writing this office.

****

POMOLOGICAL PARAGRAPHS

Leaf Analysis Service: The leaf analysis service being developed by some of the Farm Supply Companies should prove very valuable since the analysis and its interpretation is available to the grower prior to the harvest of McIntosh. With the analysis in hand, the grower can examine the trees and fruits and make sounder decisions concerning fertilization the following spring. Furthermore, the prompt service can alert the grower to possible problems for the current harvest and storage season. For example, the possibility of excessive drop because of low leaf magnesium and the lack of red color and poor keepability of fruit due to high nitrogen could be anticipated from the analyses. Better judgments can be made concerning the type of storage (CA or regular) and length of storage for fruits from various blocks with this information.

Alar Sprays for Delicious: An Alar spray applied in early or mid-August may be beneficial on Delicious that are normally picked late, without significantly reducing fruit size. Our studies have shown that Alar will reduce fruit flesh softening prior to harvest, will delay watercore development and will reduce internal breakdown following harvest, but will have no effect on storage scald. Research from other areas indicates that Alar is more effective than 2,4,5-TP for pre-harvest drop control of Delicious.

Where watercore is normally not a problem, or it is anticipated that the fruit can be harvested before the disorder becomes too severe, Alar is of questionable value on Delicious. It is too expensive to be used just to prevent pre-harvest drop. However, where watercore has been a problem, or is anticipated to be a problem, Alar can be very helpful. It should be applied at the rate of 1000 ppm (4 lbs Alar - 85 per acre of mature trees) in mid-August, keeping in mind the 45-day pre-harvest interval for this chemical. Alar will not prevent watercore, but will delay its appearance. But even though Alar is applied, the wide variation in the incidence of watercore among Delicious trees makes essential the examination of fruits from several trees in each block if apples are to be harvested before this disorder becomes too severe.

Rapid Absorption of Paraquat by Weeds: Currently, we are conducting long-term experiments in Massachusetts to determine what ef-

fects, if any, repeated applications of the herbicide dichlobenil (Casoron*) have on fruit trees. In order to eliminate as many variables as possible paraquat, a chemical mower, is being used to suppress weed and grass growth under untreated check trees and under treated trees as well. Two applications, the first in mid-May and a second in late June, are necessary to suppress growth for the season.

In 1968, the second application was made on June 25, a cloudy day with the threat of rain. Paraquat was applied at the rate of 2 quarts per acre plus 8 ounces of spreader. It began to rain intermittently while the first trees were being treated. When three-quarters of the trees had been treated, it began to rain steadily and the remaining trees were treated in the rain. Intermittent rain continued for the next 3 days.

On July 2, the orchard was visited to see if it was necessary to apply paraquat again. Surprisingly, in spite of heavy rains, the paraquat had done its job and it was not necessary to repeat the treatment. - Dominic A. Marini, Regional Specialist, Southeast Region.

*Trade Name

****

RESEARCH FROM OTHER AREAS

William J. Lord
Department of Plant and Soil Sciences

Apples in the United States: Farm Prices and Uses, 1947-1975 - Apple prices at farm-level and use of apples in the United States from 1947-1966 were studied by Dr. William G. Tomek and reported in Cornell University Agricultural Experiment Station Bulletin 1022.

The study showed that apple production increased in the United States during the 16-year period from 1951-1966 at an average rate of 2.3 million bushels per year. Although year-to-year variation in production occurred throughout this period, fluctuation has become much milder since 1951. This would indicate the use of improved cropping systems during this period.

Use of apples for processing has increased both in actual tonnage and in percentage of the total apple crop. In 1947-1950, 26.8% of the total crop was processed whereas the percentage increased to 41.7% during 1963-1966. On the other hand, the per capita sales of apples for fresh use decreased during 1947-1966, but due to the population increase total fresh sales remained approximately constant.

The farm price of apples for fresh use has shown an upward trend of approximately 2 cents per year since 1951. The price of apples for canning and freezing fluctuated greatly during 1947-1966, with no strong price trend apparent. However, there was some upward trend in price of apples used for other kinds of processing, such as for vinegar, cider and juice. Since greater tonnage of apples is being processed at the same or higher prices than in previous years, and the total sales of apples for fresh use has remained approximately the same but at a higher per unit price, the value of the U.S. apple crop has increased. Another contributing factor to the increase in crop value is the decline in the proportion of the crop abandoned.

The monetary value of a given-sized apple crop also has been trending upward. Statistical analysis of the crop and price data by Dr. Tomek suggests that the farm-level price demand for apples for fresh use is somewhat price-inelastic, which implies that smaller quantities sold at higher prices would increase total value in a given year.

****

DOES OZONE REDUCE DECAY OF FRUITS AND VEGETABLES AFTER HARVEST

William J. Bramlage
Department of Plant and Soil Sciences

Ozone (O_3) is a gas that is known to inhibit growth of molds, an effect that has been demonstrated many times in laboratories. Therefore, the question of whether or not ozone can be of practical value in reducing post-harvest decay is asked from time to time. Past studies have not always agreed on the usefulness of ozone, so a study of its effects was recently conducted by Dr. D.H. Spalding of the U.S. Department of Agriculture, Beltsville, Maryland. In this study, the effects of the gas were tested on peaches, strawberries, blueberries, grapes, cantaloupes, and green beans. The results were as follows.

Peaches: Three varieties of peaches were inoculated with spores of the brown rot fungus or the Rhizopus rot fungus and were held at 70°F for 24 hours to allow the fungi to germinate. The fruit were then stored at 35°F for 7 days in either air or in air plus 0.5 ppm ozone, and this was followed by a holding period of 2-4 days in air at 70°F to determine shelf-life. The use of ozone had no effect on the per cent decay of the peaches at either 35° or 70°F. In another test, peaches were placed in 4-quart baskets with a fruit infected with either brown rot or Rhizopus rot put in the center of the basket. The baskets were held at 30°F for 7 days, with and without 0.5 ppm ozone, to determine spread of the molds.

Ozone did reduce the spread to some degree, but a high percentage of the peaches was nonetheless infected. Ozone, which is a frequent agent in air-pollution injury to plants, did not injure the peaches in these tests.

Strawberries: Pint boxes of strawberries had either a gray mold-infected or a Rhizopus rot-infected berry placed in them and then were placed at 35°F for 7 days with or without 0.5 ppm ozone. Following storage, they were held 2 days at 60°F in air to test shelf-life. Ozone had no effect in reducing decay of the berries, and it caused the caps on the berries to shrivel and dry.

Blueberries: Pint boxes of blueberries, not inoculated with molds, were held for 2 days at 35°F with or without ozone and then held in air at 70°F for 4 days. In another test, the fruit was held 6 days at 60°F with or without ozone. In both tests, ozone had no effect in reducing decay from field infections.

Grapes: Two varieties of grapes were inoculated with gray mold spores and held for 6 or 7 days at 60°F. The presence of ozone during this time did reduce the growth of mold on the upper surfaces of the bunches, but the berries were internally infected and the undersides of the bunches were very moldy.

Cantaloupes: Uninoculated cantaloupes were kept 7 days at 45°F plus 5 days at 60°F with or without ozone. The gas reduced the amount of surface mold on the fruit but did not reduce the percentage of fruit infected with molds.

Green beans: Green beans were held 7 days at 45°F plus 5 days at 60°F. The presence of ozone did not reduce molds on the beans, and it caused blotchy brown areas to develop on 20% of the fruit due to injury.

It is apparent from these results that low concentrations of ozone are of little, if any, practical benefit in reducing post-harvest decay on these commodities. Higher concentrations of ozone cannot be used because the ozone will injure the commodities in numerous ways. Even 0.5 ppm caused injury to 2 of the commodities in these tests.

The full report ("Effects of ozone atmospheres on spoilage of fruits and vegetables after harvest," USDA Marketing Research Report No. 801) can be obtained free from the Office of Information, U.S. Department of Agriculture, Washington, D.C. 20250.

****

THOUGHTS ON THE APPLE HARVEST PROBLEM

William J. Lord
Department of Plant and Soil Sciences

Pomologists and Agricultural Engineers are frequently asked to express their thoughts on orchard modifications that might enhance harvest of apples for the fresh fruit market. Many of these workers are of the opinion that complete mechanization of harvest is possible only through radical changes in our present cultural practices. Trellised trees or free-standing trees in high density plantings are considered cultural systems that would enhance complete mechanization.

The question arises as to what changes in cultural practices to aid harvest can be currently suggested to growers. First it must be emphasized that no mechanical device for the complete mechanization of apple harvest is in sight! Therefore, it is the author's opinion that the development of the mechanical harvester must come first. Until such a device is available, we have no idea the tree spacing and tree size and shape necessary to accommodate the harvester when it becomes available. Until these answers, backed by research, are available the most logical approach for growers is to continue the trend towards smaller trees and increased tree population per acre.

Several years of research plus one year of grower trials with Alar show that this growth retardant has more promise in helping to alleviate the harvest labor problem than any picking aid currently developed for the harvest of apples for the fresh fruit market. Alar consistently inhibits preharvest drop and the rate of fruit softening of McIntosh. If growers apply this growth retardant to a fraction of their bearing McIntosh trees, firm apples can be harvested from about September 10, to mid-October. This will allow for a 5-week harvest period instead of the usual 3 week period for McIntosh.

There is considerable grower interest in harvesting from platforms with telescoping catwalks. Several of these harvesting aids are in commercial use and the construction of others is being considered in New England. Of these devices, a fixed height platform (7 feet from ground level) with telescoping catwalks that extend 11 feet appears most practical.

Unquestionably, harvesting fruit from telescoping catwalks is easier and less tiring than from ladders. Whether or not good pickers can harvest more fruit from these catwalks than using conventional methods is debatable. Our limited data on harvest rates indicate no distinct increase in boxes harvested from the catwalks in comparison to harvest from ladders. The principal problem is the unproductive time while the pickers wait for others to finish. The waiting time can be reduced somewhat with closer planting dis-

tances and machines having catwalks that extend both left and right. Apples could then be harvested from both sides of the harvesting aid as it proceeds up the rows.

It appears that harvesting platforms with catwalks may be successful in some situations---when women are employed as pickers or when a high percentage of pickers are inexperienced workers. For increasing the harvest efficiency of the majority of orchardists, however, this author suggest only the growth of smaller trees and The use of Alar at this time.

****

COST OF OXYGEN AND CARBON DIOXIDE CONTROL SYSTEMS FOR CONTROLLED ATMOSPHERE STORAGES

William J. Bramlage
Department of Plant and Soil Sciences

The above is the title of a recent publication by David Gurevitz and I.J. Pflug of Michigan State University. The authors report in this publication the results of cost-analysis studies for a number of different methods of regulating O_2 and CO_2 in CA storages. Cost-analyses were made for 15,000, 20,000, and 60,000 bushel storages and comparisons were made for high vs. low utility rates and high vs. low labor rates.

Some of the findings were the following. The most economical CO_2 scrubbing systems where utility costs are high and local labor is available are the dry-lime and water systems. Where utilities are low and labor is expensive, water scrubbing is the most economical, followed closely by dry-lime.

Oxygen reduction costs were based on 1 pulldown vs. 4 pulldowns. With either high or low utility costs, and 1 pulldown, liquid nitrogen flushing seemed most economical; for 4 pulldowns, oxygen burners were most economical.

Calculations were made for various combinations of CO_2 and O_2 removal systems, and the best combinations depended on management practices. Where a single pulldown is need, i.e., where the room is only opened once, a combination of drylime or water scrubbing with liquid nitrogen (for O_2 flushing and cooling) appeared to be most economical. If the room is to be opened more than once, a combination of any of several CO_2 scrubbers with a burner seemed most satisfactory. If a room is to be operated only partially filled, dry lime in combination with an oxygen burner offers the most economy. The calculations pointed out the necessity for a gas-tight room for economical operation of any of these systems.

The authors prepared a series of tables to compare costs among different systems, and these should prove both interesting and valuable to anyone trying to decide what systems are most economical for his conditions. The complete publication (Michigan Agr. Expt. Sta. Quarterly Bulletin 50(4):458-479, May, 1968) is available free from Michigan State University, East Lansing, Michigan.

****

All pesticides mentioned in this publication are registered and cleared for the suggested use in accordance with Federal and State laws and regulations. Where trade names are used for identification no product endorsement or discrimination is intended.

WARNING! MOST PESTICIDES ARE POISONOUS. READ AND FOLLOW ALL DIRECTIONS AND SAFETY PRECAUTIONS ON LABELS. HANDLE CAREFULLY AND STORE IN ORIGINAL CONTAINERS OUT OF REACH OF CHILDREN, PETS AND LIVESTOCK. DISPOSE OF EMPTY CONTAINERS RIGHT AWAY, IN A SAFE MANNER AND PLACE. DO NOT CONTAMINATE FORAGE, STREAMS OR PONDS.

Cooperative Extension Service
University of Massachusetts
Amherst, Massachusetts
A. A. Spielman
Director
Cooperative Agricultural Extension Work
Acts of May 8 and June 30, 1914
Official Business
480 — 5/69 — 1000
Permit No. 1216

Postage and Fees Paid
United States Department of Agriculture

FRUIT NOTES

Prepored by the Deportment of Plant and Soil Sciences
Cooperotive Extension Service
College of Agriculture
University of Mossochusetts, Amherst

EDITORS

W. J. LORD AND W. J. BRAMLAGE

JULY—AUGUST, 1969

TABLE OF CONTENTS

Issued by the Cooperative Extension Service, A. A. Spielman, Dean and Director, in furtherance of the Acts of May 8 and June 30, 1914; University of Massachusetts, United States Department of Agriculture and County Extension Services cooperating.

INCREASING APPLE ORCHARD OUTPUT

William J. Lord
Department of Plant and Soil Sciences

Dr. John C. Cain of the New York State Agricultural Experiment Station, Geneva, New York, recently published a report entitled "Tree Spacing in Relation to Orchard Production Efficiency," (N.Y. Agr. Res. Circular No. 15).

In this report, the efficiency benefits of close spacings for apple trees are discussed. Efficiency was defined simply as OUTPUT/INPUT. The output factors were resolved into bushels per tree and trees per acre, while the input factors included planting, production and harvest costs.

In spite of technological advances, efficiency increases have barely kept pace with inflation and higher living standards. Yields per tree have improved considerably, but according to Dr. Cain, too little attention has been given to a study of tree spacing in relation to land-use efficiency and its effect on production per acre. Using some of the information presented by Cain as well as other data and ideas, the writer has attempted below to analyze our Massachusetts orchards and visualize how production efficiency can be increased.

Many of our older orchards are spaced 40' x 40' and as pointed out by Dr. Cain, at maturity the trees may actually cover no more than 50-60% of the land. Furthermore, at least 25 years are required for these trees with 40' x 40' spacing to reach maximum production. If production were approximate linear function of the land area covered by the trees, the lifetime production efficiency in terms of land usage in a 40' x 40' planting could be no more than 30-35%. However, as it will be pointed out later, yield per square foot of space occupied by the tree is greater for the smaller tree.

What can be done to improve land utilization and production per acre for trees on seedling roots? First, Cain suggests the elimination of cross alleys. With air blast sprayers and chemical control of weeds in the tree row, the necessity for spraying and mowing or cultivation in both directions is eliminated. Therefore, input is reduced and efficiency is increased. Second, the minimum alley width required for orchard travel needs to be determined and used. Grower opinion regarding travel space needed, appears to vary between 7 to 10 feet. If it is assumed that an 8-foot alley is needed, trees on seedling roots can be planted 32' x 40' instead of 40' x 40'. Tree number per acre is increased 26% (27 to 34 trees) and an equal gain in production is possible with no more miles of rows to travel. The space requirement of trees will vary with variety and soil, however, and the maintenance of trees on seedling roots at planting distances of less than 32' x 40' is possible. Furthermore, tree size <u>can</u> and <u>is</u> being controlled by restrictive pruning and filler trees in many blocks are not being removed which makes higher yields per acre possible.

Now let's look at our plantings on size-controlling stocks, most of which are on EM VII rootstock, in terms of efficient land utilization. In the past, we recommended a 20' x 30' spacing for McIntosh on EM VII rootstock. Three possibilities exist in these plantings regarding space: (a) the trees may not fully utilize the space alloted; (b) it may take an excessive number of years to fill the alloted area; or (c) the spacing is too close.

Dr. Cain cited a report of National Fruit Trials in England which indicated that the average spread of 89 varieties on EM VII rootstock was about 10 feet at 10 years of age and that they can conveniently be held to this size by minimum peripheral pruning. However, variations due to variety, soil, nutrition and climate may cause wide differences from this figure. In 1963, the branch spread on 19-year-old McIntosh on EM VII in the University of Massachusetts orchard in Amherst, averaged 29 feet, with a range of 27 to 31 feet. No attempt had been made to confine the spread of these trees by pruning. Since 1963, the height (12' to 14') and the spread has been restricted.

Data shown below (Table 1) for branch spread and yield of a young McIntosh orchard on EM VII in Shelburne, Mass., planted 20' x 30', 72 trees per acre, also indicate the vigor of this variety on EM VII. It would appear that McIntosh on EM VII in Massachusetts is much more vigorous than trees on similar stock in England, and that we can assume that trees here will fill the 20' x 30' spacing alloted this variety in the past. When these trees eventually obtain a spread of 20 feet, they will fill about 66% of the land area if a 10 foot alley is maintained.

Table 1. Spread and yields of young bearing 'McIntosh' trees in Shelburne, Mass. 1965-1968.

Yield	Tree age	Tree spread	Yield (boxes/tree)	Yield (boxes/acre)
1965	4	8.0	0.23	17
1966	5	9.8	0.88	63
1967	6	12.3	3.30	238
1968	7	14.3	3.10	223

[1]Measurements made by taking 2 measurements at right angles to each other. Measurements were made from the tip of the outermost branch on one side of the tree to the outermost tip on the opposite side.

Dr. Cain stressed the importance of filling the land area quickly with bearing surface and cited the beneficial effect of close tree spacings on the lifetime production of the orchard. At 8' x 16' spacing with an 8 foot alley, the trees will occupy 50% of the land in 8 years and will be near maximum production. On

the basis of equal production per unit of land area utilized, the total lifetime production of the 8' x 16' planting will be about 50% greater than a 15' x 30' planting at 30 years of age. Therefore, he concluded that if we can accurately estimate the spacing at which trees can be economically maintained by pruning, and can maintain high yield per square foot of tree-spread for a reasonable lifetime of the tree, great gains in production can be achieved by choosing the proper spacing at planting.

With a constant alley width, land utilization favors the larger tree. For example, with a constant alley of 8', an 8' x 16' planting of trees will eventually occupy 50% of the land, whereas a 32' x 40' planting will occupy 80% of the land at full spread.

If one assumes equal yield per square foot of space occupied, the larger tree may eventually surpass the smaller trees in production. However, Cain showed that small trees produce higher yields per foot of space occupied by the trees. When he applied the factor for yield in lbs/ft^2 of tree-spread to the calculation of space occupied at different tree spacings, he concluded that with a constant alley-way of 8 feet, the smaller tree properly spaced produces more bushels per acre and reaches maximum production at an earlier age, thereby eliminating the possibility of the larger tree ever exceeding the smaller tree in lifetime production.

Dr. Cain estimated the efficiency and net return for lifetime-average bushels per acre for a 40-year-old orchard at various spacings. Tentative cost values were assigned for the various input factors and these costs were converted to bushels of apples so that input and output could be expressed in the same units. His calculations showed the following. "The total input per acre per year is much greater for the smaller trees, but is largely accounted for by the cost of harvesting greater yields. Efficiency (output/input) is only about 25 per cent greater for the 12' x 20' planting than for the 32' x 40' planting. However, the net gain (output-input) for the smaller tree is over 2.5 times that of the large tree. The maximum efficiency and net gain for life-time production appears to be obtained from a tree about 12 feet wide, but variations in orchard lifetime; weather conditions, and other variables of estimate could not justify distinction between tree sizes of 8 to 15 feet. However, there does not appear to be any good reason to plant trees whose final spread is expected to exceed 20 feet."

With the information quoted above in mind, let's re-examine our older recommendation of <u>20' x 30' spacing</u> and our newer suggestion of <u>15' x 25' spacing</u> for McIntosh on EM VII. Some persons are talking about the possibility of restricting tree spread of McIntosh on EM VII to 6 feet. The question is: Would it have been possible to restrict spread to 6 feet in the University of Massachusetts orchard mentioned above without forcing excessive vegetative growth and without reducing yields? Furthermore, Dr. Cain's calculations indicated <u>no distinct differences between 8 feet and</u>

15 feet tree-spread regarding efficiency. It would appear, therefore, that our current recommendations of 15' x 25' spacing for McIntosh on a good orchard soil is reasonable from the standpoint of maximum efficiency and a high lifetime production of the orchard. (Dr. Cain is suggesting 13 feet for McIntosh on EM VII, plus or minus 2 feet depending on soil capability.) With the 15' x 25' spacing, a 10-foot alley was considered necessary for bulk boxes and space to drive past the boxes. As previously mentioned, however, grower opinion regarding travel space needed appears to vary between 7 and 10 feet.

Growers who have established close spacings--6' x 14', 10' x 18' and so forth--have in mind the development of tree walls and the possible use of a harvesting aid. Restricting tree size and maintaining productivity at these spacings will challenge the horticultural ability of the grower. Since the ultimate answer as to the planting distance, height and spread of our trees is not known, it would appear based on the data presented by Dr. Cain, that the more conservative spacings of 15' x 22' to 15' x 25' should enable the grower to obtain high lifetime yields without encountering problems that may arise with closer tree spacings.

SUMMARY

The inflationary spiral must be counteracted by similar increases in orcharding efficiency for the industry to remain profitable in the future. Fortunately, significant increases in lifetime yields per acre are possible through better utilization of land. Spacings of 40' x 40' or greater are no longer needed for trees on seedling roots. New production techniques--herbicides, restrictive pruning with hand tools, air blast sprayers, and mechanical pruning have eliminated the need for the cross-alley and filler tree removal in many instances. The alley for the movement of orchard equipment can be kept to the absolute minimum to reduce tree spacing between rows.

Small trees on size-controlled rootstock, properly spaced, produce more bushels per acre and reach maximum production at an earlier age than larger trees. Hopefully, within a few years we will be able to predict, with reasonable accuracy, the size at which we can hold the tree with a minimum cost of pruning and a size at which high yields per square foot of tree spread can be maintained for the lifetime of the tree.

****

POMOLOGICAL PARAGRAPH

Certified Sweet Cider and Approved Farm Stand Programs: At a meeting held on March 11, 1969, the Certified Cider Program members voted to permit the use of potassium sorbate as a preservative in Certified Cider sold wholesale or in retail stores. However, a label other than the Certified Cider Label must be used. A "wholesale label" is now being designed for use this marketing season. At the same meeting, the Approved Farm Stand operators voted to use the Apple Blossom Queen for promotional purpose at their stands during the fall of 1969.

****

NEW EXTENSION PUBLICATIONS

William J. Lord
Department of Plant and Soil Sciences

The Massachusetts Cooperative Extension Service has recently published a bulletin which summarizes information concerning (a) nature of herbicides and their fate in soil; (b) tree tolerance to herbicides; and (c) herbicide phytotoxicity symptoms. This publication, Herbicides - Their Nature, Persistence and Effect on Fruit Trees, (Massachusetts Extension Service Publication 32, Jan. 1969) should be of interest and value to persons using herbicides in orchards.

One section of this publication is devoted to descriptions and photographs of phytotoxicity symptoms of several herbicides now labeled for orchards. Fruit growers should find this section of the publication of particular value.

Another recent Massachusetts Cooperative Extension Service Publication is Special Circular 289. Suggestions for the Use of Alar on Apple Trees. In this circular, we have summarized our current knowledge of this compound and made suggestions for its use in Massachusetts orchards.

Copies of the publications mentioned above are available without charge from your County Extension Office or the Department of Plant and Soil Sciences, French Hall, University of Massachusetts, Amherst, Massachusetts 01002.

****

THE APPLICATION OF CONCENTRATE SPRAYS ON APPLES BY LARGE AIRBLAST SPRAYERS

F.H. Lewis[1]
Pennsylvania State University
Fruit Research Laboratory
Arendtsville, Pennsylvania

I would like to take my assigned topic of concentrate sprays and expand the discussion to a consideration of the overall pest control program on apples and the place that pesticide application methods have in changes for the future.

We have four major problems in the apple pest control field. These problems, not necessarily in the order of their importance, are (i) a continued need for new miticides and mite control programs, (ii) the concern of our customers and the government regarding chemical residues, (iii) the cost of the pest control program, and (iv) the labor problem, including cost, availability and skills. Concentrate sprays have a vital role in our plans for the solution of all of these problems.

Dean Asquith and I began work on concentrate sprays nearly 20 years ago. In the beginning, our interest was based primarily on cost figures. A similar approach may be useful here.

When a grower purchases a large airblast sprayer at about $9600, the annual fixed cost of owning that sprayer will be about $1500 for depreciation (10% of cost less 10% trade-in), interest (7% on bank loan repaid in 10 years), fire insurance (60 cents per $100 on the amount owed), and shelter (1% of cost of machine). Many growers would use this machine no more than 200 hours each year. The variable costs for 200 hours work are estimated at about $600. This would include repairs, lubrication, gasoline and oil. The labor cost is estimated at $2.50 per hour. Thus, if the sprayer is used only 200 hours each year, the cost per hour for the sprayer and one man will be about $13.00. This could be reduced to about $10.00 per hour by using the sprayer about 400 hours each year. These costs have gone up over 42 per cent in 6 years.

It is necessary to have a tractor to pull the sprayer and a good tractor for work on somewhat hilly land is apt to cost at least $6000. If this tractor is used throughout the year, it may cost no more than $2.00 per hour. The cost of the sprayer, tractor and one man would then add up to $15.00 per hour for 200 hours spraying each year and about $12.00 per hour for 400 hours spraying.

Assuming that the sprayer does not break down, the total time in the orchard is spent in spraying, turning on row ends, and re-

---

[1] Talk presented by F.H. Lewis at fruit meetings in Maryland and West Virginia. Printed with his permission.

filling. With dilute sprays, applied by two men using a sprayer, tractor, refill unit and a truck, the time spent in actually applying spray is less than 50% of the total time in the orchard. When the sprayer is changed from dilute to 3X or 4X concentrate, there is a very rapid increase up to about 75 in the percentage of the total time spent in actually applying spray. This means that there is a very rapid increase in the acreage covered each day and a very rapid decrease in costs per acre (about $4.00 for dilute/acre down to about $2.80 for 3X if the grower has sufficient acreage to still use the sprayer for 200 hours each year). The increase in efficiency beyond 3X or 4X is slow, and for several years it seemed that we could not make much further progress in cost reduction.

In 1963, Dr. Donald Frear and his coworkers from several states published a bulletin in which they gave data on the rate of disappearance of many chemicals from crop plants. These data, and those of many other workers, showed that with many pesticides the spray residue on the plant decreased rapidly within the first few days after application. Thus, such pesticides can logically be considered short-life chemicals not adapted to spray schedules with very long intervals between sprays.

In 1964, Dr. K.D. Hickey and I published the results of studies in which we found that we obtained good spray coverage and a light chemical deposit on more than 90 per cent of the leaves on pruned apple trees sprayed only from one side with an airblast sprayer traveling at 2 mph and delivering 90,000 cfm air at a velocity of about 125 mph.

In 1965, it was clear that we had reached a point where the whole situation could be reviewed. The refill unit and its driver were being used only a few minutes of each hour with the sprayer operating a 3X; if this could be increased to 6X perhaps they would not be needed at all. If spraying from one side gave reasonable coverage of over 90 per cent of the leaves with chemicals which tended to disappear within a few days, why not apply these chemicals from alternate sides of the row at weekly intervals (left one week, right the next) and attempt to maintain a fresh spray residue at maximum effectiveness. This might allow a substantial cut in the use of chemical per year as compared to 3X sprays applied in the usual way at the usual intervals.

This idea of alternate row spraying with large airblast sprayers has been under trial for four years and is in use in many orchards. Properly managed, a program of this type can fulfill several objectives that every fruit grower is interested in. The work can be scheduled at a definite time each week. The total cost of what we might call a maintenance-type program in a good commercial orchard should run in the range of 50 to 65 per cent of the dilute spray program as listed in our Pennsylvania bulletin. The use of chemicals per year has been cut substantially; so both residue and spray injury problems have been decreased. The filler unit and the second man in the spray crew can be eliminated on many small to medium-sized farms.

I will now outline my concept of an efficient spray operation aimed at the objective of using less labor to apply less chemical in a more carefully controlled way while stabilizing or lowering pest control costs.

Proper supervision is required. The sprayer must be calibrated to deliver the proper amount of spray for each 40 feet of row space. The rate of travel when spraying mature apple trees should be kept at 2 mph. Spraying should be done under as favorable conditions as possible, but in alternate row spraying we have made the application within one day of the scheduled time. A count on the mite population should be made at weekly intervals from mid-June until mid-August.

Proper equipment is essential. A speedometer or tachometer should accurately measure ground speeds of 2 to 3 mph. The sprayer should have sufficient air delivery and air velocity to spray in two directions (right and left) and drive the spray into and well above the trees. In most orchards, it should do this against winds of 5 to 8 mph. Centrifugal pumps developing 80 to 100 psi pressure have not been satisfactory for applying concentrates beyond 3X or 4X because of poor break up of the spray. Centrifugal pumps developing 180-200 psi pressure have worked well with sprays up to 6X, but at 10X, the spray has been heated,with chemical deposits and clogging in some cases, by pumps which were discharging only about 5% of their capacity. Nozzle discs should be of ceramic or special metal since ordinary discs wear rapidly.

For large trees, I like airblast sprayers with a heavy duty high pressure pump set at 200 psi pressure, an air delivery of 90,000 - 100,000 cfm, and an air velocity of about 125 mph. Most of our spraying is done during daylight hours. There usually is some wind to combat. One of the basic problems in using concentrates is that force is required to obtain deposit of fine spray droplets in tree tops. My comparisons of medium versus large-size airblast sprayers with the same air velocity have shown a significant improvement in chemical coverage and deposit at any height on the tree with the larger unit. I freely admit, however, that a sprayer is a tool, and a combination of a relatively small sprayer and a good manager can result in excellent pest control.

In general, with the equipment indicated above, I think that most growers should apply the early-season oil spray at 3X and then change to 6X for the remainder of the season. In some cases, it might be well to go to 10X for one or two scab sprays. However, I think that the exact degree of concentration will be determined in many cases by the work schedule of the employees. If the men normally work from 7 to 11:30 A.M., then a spray concentration should be chosen which will allow the application of three or four tanks within that time.

To calibrate an airblast sprayer for the application of 3X spray on mature apple trees at 2 mph, insert a pressure gauge into the sprayer manifold, partially fill the sprayer with water, and

determine the pressure while running the sprayer with all nozzles open. Then, with the help of tables supplied either by the Extension Service or the sprayer dealer, choose the nozzles required for the output of 17.6 gallons per minute (8.8 gallons from each side). About 85% of the total spray output should be from the top two-thirds of the air outlet. Usually, this means that one small nozzle is placed in the lower third of the air outlet, the top nozzle outlet is closed, and the remainder of the nozzles are spaced in the upper two-thirds of the air outlet with the larger nozzles at the top.

For 6X sprays to be applied at 2 mph, choose the nozzles required for a total sprayer output of 8.8 gallons per minute. We try to use at least 6 or 7 nozzles on each side of the sprayer in order to obtain good distribution of the spray in the air stream.

Timing of the sprays is very important. My work with alternate row spraying has been based on 7-day intervals between sprays (row middles 1 and 3 one week, 2 and 4 the next week)but I would vary this by one or two days under special conditions. We have applied the spray under any conditions except heavy rain or wind above 8 mph. In hot, dry summer weather, we have done most of the spraying before 9 A.M. It is hard to get good spray deposit on a very hot, dry day.

In most of the work with 6X sprays, we have mixed the chemicals at 4X. This means 4 times the standard recommended amount of each chemical. For example, the Pennsylvania spray program calls for Captan 50W to be used at the rate of 2 lbs. per 100 gallons of dilute spray early in the season. Mixing this chemical at 4X means that it is mixed at 8 lbs./100 gal. early in the season and at 6 later in the season (1.5 lbs. dilute).

While mixing the chemicals at 4X has been successful in our trials with an exception to be noted later, it should be clearly understood that the amount of chemical used should be adjusted to conditions. It would be foolish to use a very low amount of miticide or fungicide under conditions where maximum effectiveness was needed.

In trying to obtain low cost pest control by using large airblast sprayers to apply moderate amounts of chemical from alternate row middles, we control the type of equipment used, the amount of spray applied, the interval between sprays, and the kind and amount of chemical. Such a program, properly supervised, has been successful at 50 to 65 per cent of the cost of the present Pennsylvania dilute spray program for apples. The principal dangers are (i) that growers will attempt to cut chemical usage without the necessary control of equipment and application method, (ii) that less than about 30 gallons of spray per acre may not give control of powdery mildew and (iii) that oil sprays of less than 100 gallons of spray

per acre may not give maximum mite control. Our only failure with the program has been in one case where the miticide was greatly reduced in an orchard with a mite population resistant to the miticide.

Literature Cited

Frear, D.E.H. 1963. Pesticide residue investigations on raw agricultural commodities. Pennsylvania Agr. Exp. Sta. Bull. 703:1-77.

Lewis, F.H. and K.D. Hickey. 1964. Pesticide application from one side on deciduous fruit trees. Pennsylvania Fruit News 43 (April): 13,17,19-24.

****

All pesticides mentioned in this publication are registered and cleared for the suggested use in accordance with Federal and State laws and regulations. Where trade names are used for identification, no product endorsement or discrimination is intended.

WARNING! MOST PESTICIDES ARE POISONOUS. READ AND FOLLOW ALL DIRECTIONS AND SAFETY PRECAUTIONS ON LABELS. HANDLE CAREFULLY AND STORE IN ORIGINAL CONTAINERS OUT OF REACH OF CHILDREN, PESTS AND LIVESTOCK. DISPOSE OF EMPTY CONTAINERS RIGHT AWAY, IN A SAFE MANNER AND PLACE. DO NOT CONTAMINATE FORAGE, STREAMS OR PONDS.

Cooperative Extension Service
University of Massachusetts
Amherst, Massachusetts
A. A. Spielman
Director
Cooperative Agricultural Extension Work
Acts of May 8 and June 30, 1914

Official Business
489 – 7/69 – 1000
Permit No. 1216

Postage and Fees Paid
United States Department of Agriculture

FRUIT NOTES

Prepared by the Department of Plant and Soil Sciences

Cooperative Extension Service

College of Agriculture

University of Massachusetts, Amherst

EDITORS

W. J. LORD AND W. J. BRAMLAGE

SEPTEMBER–OCTOBER, 1969

TABLE OF CONTENTS

Issued by the Cooperative Extension Service, A. A. Spielman, Dean and Director, in furtherance of the Acts of May 8 and June 30, 1914; University of Massachusetts, United States Department of Agriculture and County Extension Services cooperating.

FACULTY VACANCY FILLED BY DR. DUANE W. GREENE

Franklin W. Southwick, Head
Department of Plant and Soil Sciences

Dr. Duane W. Greene has been appointed as an Assistant Professor, effective September 1, 1969, in the Department of Plant and Soil Sciences. He is filling the vacancy which arose follow- the untimely death of W.D."Squire" Weeks in July, 1968.

Dr. Greene is a young man who has just completed his Ph.D. program in the Horticulture Department at Michigan State University. He is a native of Albany, New York and did his undergraduate work in Botany at Colgate University.

While at Michigan State University, Dr. Greene did research under the guidance of Dr. M.J. Bukovac, on foliar absorption of naphthalene acetic acid in pear leaves. Duane Greene is well trained and has a strong interest in the general area of growth regulators and will be able to provide us with considerable additional expertise at both the practical and fundamental level. He will be intimately involved with our research programs at the Horticultural Research Center, Belchertown, so we shall have added research support for our deciduous tree fruit program within the state.

****

EFFECTS OF WAXING ON APPLES

Michael R. Shipway and William J. Bramlage
Department of Plant and Soil Sciences

A great deal of interest and controversy has arisen in recent years among fruit growers over the question of whether or not to wax apples. The trend today is toward waxing. It has become a widespread practice among Western apple packers, and it is being adopted by a growing number in the East. In response to questions about the post-harvest effects of waxing on Eastern apples, we conducted the following tests with commercially-waxed fruits during the 1968-69 storage season.

Samples of 'McIntosh,' 'Richared Delicious,' and 'Golden Delicious' apples were coated with Johnson "Primafresh 31" wax in the commercial operation at Hawbuck Orchards, Harvard, Massachusetts. The system was applying wax at the rate of about 3 gallons per thousand bushels. Some of the fruit were then evaluated immediately by placing them at 75^{o}F and 45% R.H. and examining them at 3-day intervals. Other samples were stored at 32^{o}F and 90-95% R.H. for several months before evaluation at 75^{o}. These conditions were chosen to

assess waxing done just before marketing as well as waxing done prior to storage. 'McIntosh' were evaluated for weight loss, appearance, firmness, ground color, and brown core (after storage). 'Delicious' were assessed for weight loss, appearance and firmness, and also for the loss of watercore and development of internal breakdown during and following storage. 'Golden Delicious' were evaluated only for weight loss and appearance. The results of the tests were as follows.

'McIntosh': Waxing greatly enhanced the glossiness of McIntosh apples and this effect persisted throughout the tests--even after 4 months of storage followed by 12 days at 75°F. In addition, it reduced weight loss of the fruit. Waxed apples evaluated immediately lost about one-third less moisture than non-waxed fruit during extended exposure to high temperature-low humidity conditions (Table 1). At the end of this test, there were about twice as many shriveled fruit in the non-waxed as in the waxed lots. However, during storage at low temperature and high humidity, the waxing did not reduce moisture loss, and after storage its reduction of moisture loss was consistent but small. Thus, on 'McIntosh' the waxing did reduce shrinkage under extended adverse conditions, with the effect being greater on freshly harvested than on stored fruit. However, waxing did not reduce shrinkage during storage.

An additional benefit from waxing was a delayed yellowing of the fruit (Table 1). After 12 days at 75°F, waxed apples were no more yellow than were non-waxed ones after 6 days at 75°. After storage and 12 days at 75°, waxed apples were no more yellow than the non-waxed ones had been immediately after storage. Toward the end of the tests, the waxed samples were easily distinguishable from the non-waxed ones on the basis of ground color. There was no effect of waxing on fruit firmness or on the incidence of brown core after storage. There was a greater percentage of decay in the waxed samples than in the unwaxed ones, perhaps due to physical damage incurred during the handling and waxing procedures.

'Richared Delicious': The effects of waxing on appearance and weight loss of 'Delicious' were similar to the effects on 'McIntosh.' Waxing greatly increased glossiness of the apples and moisture loss from waxed ones was considerably reduced at high temperature and low humidity shortly after harvest (Table 2). There was no difference in shrinkage between waxed and unwaxed fruit during storage, and differences following storage were small. Waxing had no evident effect on ground color or firmness of 'Delicious,' and it did not affect either loss of watercore or development of internal breakdown during or following storage.

'Golden Delicious': Waxing of 'Golden Delicious' apples reduced weight loss considerably at 75°F and 45% R.H., but the fruit still lost so much moisture that shriveling occurred quickly. After only 3 days, many of both the waxed and unwaxed 'Golden Delicious' were noticeably shriveled and all deteriorated quickly.

Table 1. Loss of weight and change in ground color of 'McIntosh' apples at 75°F and 45% R.H. 1968-69.

Days at 75°F	Per cent weight loss		Ground color[1]	
	Not waxed	Waxed	Not waxed	Waxed
	Immediately after waxing			
0	-	-	4.0	4.0
3	1.1	1.0	4.0	4.0
6	2.8	1.9	3.8	3.8
9	4.0	2.8	3.1	3.8
12	5.5	3.8	3.1	3.7
15	6.8	4.8	2.9	3.3
	After storage[2]			
0	4.3	4.1	3.3	3.9
3	5.4	5.2	3.0	3.4
6	6.3	5.9	2.8	3.3
9	7.7	7.0	2.9	3.5
12	8.8	7.7	2.7	3.4

1/ Assessed with Cornell ground color chart; 5 = green and 1 = yellow.

2/ Stored for 4 months at 32°F and 90-95% R.H. following waxing.

Table 2. Loss of weight by 'Richared'Delicious' apples at 75°F and 45% R.H. 1968-69.

Days at 75°F	Per cent weight loss	
	Not waxed	Waxed
	Immediately after waxing	
3	2.0	1.6
6	4.0	3.1
9	6.0	4.7
12	7.8	6.2
15	9.2	7.4
	After storage[1]	
0	6.9	6.3
3	7.7	7.0
6	8.7	8.2
9	9.9	9.4

1/ Stored for 4 months at 32°F and 90-95% R.H. following waxing.

Conclusions: In general, it can be said that waxing distinctly improved the glossiness and overall appearance of most fruit. It was noted, however, that this increased glossiness accentuated imperfections such as bruises or russeting. Waxing also reduced shrinkage of the apples under adverse conditions and delayed shriveling of 'McIntosh' and 'Delcious' but not of 'Golden Delicious.' Furthermore, it delayed yellowing of 'McIntosh' fruit. It had no adverse physiological effects at the rates of application employed in these tests. Caution must be exercised though, for heavier applications are known to cause fermentation and off-flavors of the fruit.

As to whether or not waxing should be employed, the individual apple packer will have to weigh such factors as the additional cost, potential danger of over-waxing and induction of fermentation, and possible accentuation of the appearance of imperfections, against the considerably greater glossiness, possible reduced shrinkage during adverse conditions, and possible delayed yellowing of at least some varieties of apples. Nevertheless, it seems that waxing is now an established part of the fruit packing industry, and the pressure on the individual packer to conform to the industrial trend will likely grow.

****

POMOLOGICAL PARAGRAPH

William J. Lord
Department of Plant and Soil Sciences

Ounces per tree of dichlobenil: Last fall several growers expressed the need for a table showing the number of ounces of dichlobenil required per tree with hand applications on an individual tree basis. Consequently, the following table is presented for your information and use.

Area treated around the base	Ounces of Dichlobenil G-4	
	At rate of 100 lb/A	At rate of 150 lb/A
Square area		
6' x 6'	1.3	2.0
8' x 8'	2.4	3.5
10'x 10'	3.7	5.5
12'x 12'	5.3	7.9
14' x 14'	7.2	10.8
Circular area		
6' diameter	1.0	1.6
8' diameter	1.8	2.8
10' diameter	2.9	4.3
12' diameter	4.2	6.2
14' diameter	5.7	8.5

THE POLYETHYLENE PALLET COVER PLUS DIFFUSION WINDOW CA SYSTEM

R.M. Smock and G.D. Blanpied
Dept. of Pomology, Cornell Univ., Ithaca, N.Y.

(Editors' note: In the March-April, 1969 issue of Fruit Notes, reference was made to an unusual CA system developed in France ("What's New With CA Storage"). - The following article is reprinted here to provide more information about this system.)

P. Marcellin and J. Leteinturier of the National Center for Scientific Research at Bellvue, France have patented 2 ingenious modifications for CA storage of fruits and vegetables (1). One system involves the use of a heavy (120 micron) polyethylene pallet cover fitted with a silicone rubber elastomer (dimethyl polysiloane on nylon cloth) "window." This is illustrated in Figure 1. This diffusion area provides for differential movement of carbon dioxide and oxygen. Carbon dioxide permeability is about 6 times that of O_2.

We "field tested" the pallet cover plus diffusion window with McIntosh apples.[1)] Field heat was removed to 38°F and then 36 boxes of apples were sealed in the pallet cover. The atmosphere was analyzed daily except for Sundays. The apples were held at 38°F for 48 days at the start of the trial. Figure 2 shows that the oxygen dropped to 5% in 12 days and 3% in 22 days. The CO_2 rose to 5% in 7 days. Both gases then remained remarkably constant during the remainder of the 48 days. Now the

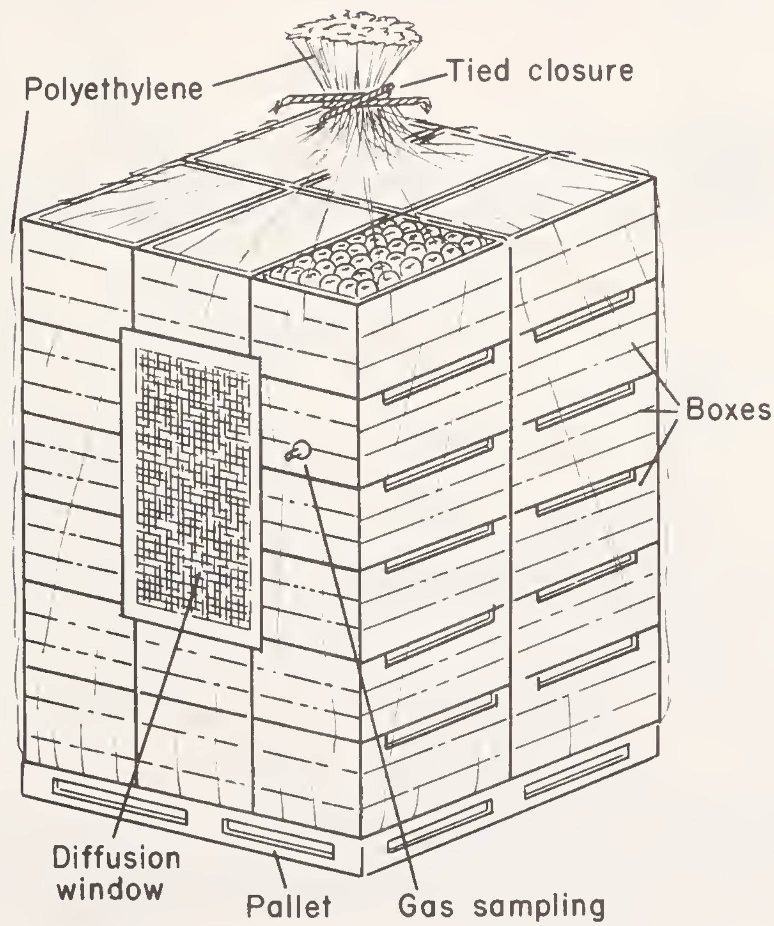


Fig. 1. Polyethylene pallet cover with diffusion window. (From: Ulrich and Marcellin. (NRS, Bellevue, France. 1968.)

1)Supplied from France by Rhodia Inc. New York, New York

apples were held at 32°F for the next 15 days. The O_2 now rose to 10% and the CO_2 dropped to 2-3%. After this period, the temperature was raised to 38°F. The O_2 percentage leveled off at 6% and the CO_2 at 4%. This observation confirms the recommendation that temperatures somewhat above 32°F work best. Our observation was that the window did not properly work after a 2 week period at 32°F. Whether this was because of condensed water was not clear.

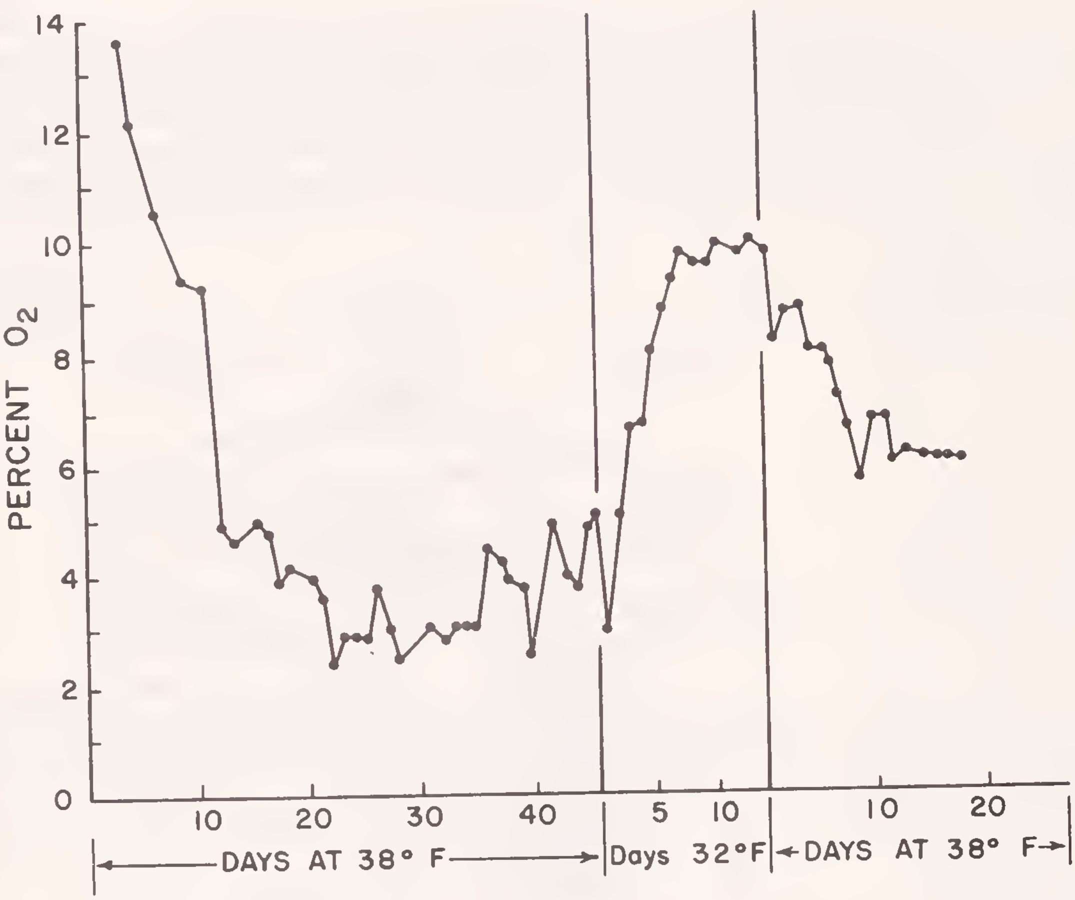


Figure 2. Oxygen levels in pallet cover and window at 38° and 32°F with McIntosh apples.

Our tentative evaluation of these "CA pallet covers" follows. When the right quantity of apples and the right temperature were used, surprisingly good atmospheres were obtained. For use in caves, as is done in France, they seem quite logical.

We do not see the practicality for their use in American cold storages for the following reasons.

1. Expense: They would seem to be more expensive than conventional CA storage. We estimated an annual cost of 18 cents per bushel for just providing the CA conditions. The actual cost per cubic foot of refrigerated storage space would be much higher for the pallet covers since so much space is wasted. Walk space is left between the pallets so that periodic gas analysis can be made. Otherwise each pallet must be piped to a central point for gas analysis. While the recommendations call for only periodic analysis of individual pallets, it would seem necessary to analyze all of them at least early in the season to find the "leakers." Extra labor and time are involved in removing or adding fruit to a given pallet if the atmosphere is not correct.

2. Limited applicability: It is not at all clear that this technique works well at 32°F. This would exclude use of this procedure for Golden Delicious, Delicious, Rome Beauty, Jonathan and other varieties in CA storage.

3. Odor: There is a strong odor in the membranes. It is recommended by the inventors that the apples be aired out 3-4 days before selling them.

Literature Cited

1. Marcellin, P. and J. Leteinturier. 1967. Premieres applications industrielles des membranes de caoutchouc de silicone a l'entreposáge des pommes en atmosphere controlee. Congress Int. Froid Madrid 5.16 1-0.

****

APPLE HARVESTING AND STORAGE SYMPOSIUM PROCEEDINGS AVAILABLE

In March of 1968, the Agricultural Engineering and Plant and Soil Sciences Departments of the University of Massachusetts jointly sponsored a two-day New England Apple Harvesting and Storage Symposium. The Proceedings of that Symposium have been delayed in publishing, but are now available.

The Proceedings contain 22 articles covering 150 pages divided into six major units: Harvesting; Harvesting Aids for Standard Sized Trees; Harvesting from Tree Walls; Storage Disorders and Quality Evaluation; Storage Atmosphere Regulation; and Structures and Handling. There are numerous tables, graphs, drawings and photographs to more clearly depict research findings and information presented by the contributors.

Specific topics include modifying trees for mechanical harvesting; mechanical harvesting from standard trees; functional descrip-

tions of several research and commercial harvesting machines and aids; pre- and post-harvest effects of alar; watercore; time-shared automatic control for CA storages; and new concepts of storage and handling facilities. Papers included reflect knowledge of commercial organizations and educational institution research as well as grower experience and provide representation from New York, Pennsylvania, Michigan, Washington, Canada and Virginia as well as the New England area.

Copies of the Proceedings may be ordered at $4.00 per copy by writing for Publication No. 35, "New England Apple Harvesting and Storage Symposium Proceedings" to:

R.G. Light, Associate Professor
Agricultural Engineering Building
University of Massachusetts
Amherst, Massachusetts 01002

Please enclose payment with your order, making checks or money orders payable to the University of Massachusetts.

****

FALL PLANTING OF FRUIT TREES

J.F. Anderson
Department of Plant and Soil Sciences

At a recent twilight meeting, the question arose about the feasibility of fall planting of apple trees in Massachusetts. Fall planting of fruit trees has not been recommended for Massachusetts because of the high probability of winter injury to the trees. Furthermore, in many years it is not possible to secure trees which are fully dormant in time to plant before the ground freezes.

In a very limited comparison of fall vs. spring planting, conducted over a period of 2 years in Amherst, the following was noted: (1) 20% of the Delicious trees set November 7, 1958, were winter-killed to within 3 inches of the bud union during the winter of 1958-59; (2) Delicious trees set in April, 1959, did not show any winter injury during their first winter (1959-60) in the orchard; (3) Delicious trees set October 14, 1959, showed considerable winter killing, several to within 12 inches of the bud union during their first winter (1959-60); (4) spring-planted trees (April, 1960) showed no winter injury during their first winter in the orchard; (5) there was an indication that the fall-planted trees not winter-injured were somewhat larger in trunk circumference after the first year in the orchard. Unfortunately, these trees sustained mechanical and mouse damage in 1961, and further records were not taken.

Several advantages given for fall planting are: (1) weather conditions are more favorable in the fall; (2) frequently the soil is in better condition in the fall than in the spring; and (3) fall-planted trees will start growth as soon as conditions are favorable and this is often before trees can be planted in the spring.

Although some growers have planted apple trees in the fall with success in Massachusetts, we would caution that fall planting be attempted only when the following conditions prevail: (1) the trees to be planted are fully dormant; (2) the site being planted has a well-drained soil not subject to frost heaving; (3) the trees can be planted before any appreciable frost forms in the ground so that the soil can be worked well around the root system; and (4) the roots of the trees are not exposed to temperatures below 25°F during the planting process.

We would expect to have less success with fall planting of peach trees than we have had with fall planting of apple trees.

****

CONTROL THOSE ORCHARD MICE!

John W. Lanier, Wildlife Biologist
U.S. Fish and Wildlife Service

To avoid mouse damage to fruit trees during the winter months, it is necessary to engage in a mouse control program. Fall is not too far away, so a mouse survey should be undertaken soon to pinpoint the trouble spots and determine the areas which will need extensive treating.

There are two kinds of mice, meadow and pine, which cause damage to fruit trees in the Northeast. The meadow mouse which is common in all orchards, lives on the surface. It is chunky in appearance, and its tail is longer than its hind foot when stretched back. Meadow mouse runways are on the surface of the soil and may be found by parting the vegetation. The runway systems may remain long after the mice are gone, so it is necessary to determine which trails are active. Presence of fine roots, mold or fungus growth, spider webs, and green grass shoots indicate unused runways. Active runways contain piles of fresh grass clipplings droppings and chewed apples.

The pine mouse is an underground type and lives in extensive tunnel systems. The tunnel systems vary from just under the soil's surface to two or more feet deep. The pine mouse, also chunky in appearance, usually is smaller than the meadow mouse when full grown. Its tail is shorter than the extended hind foot. This animal's runways may be found by probing in the soil between the tree trunk and the drip line. In some cases, newly-excavated piles of soil

are characteristic of its presence. Also characteristic are tunnels whose openings are covered by an apple drop with its underside chewed out.

Orchard mice, like all other animals, require food and shelter for survival. Their control is based upon either eliminating the two necessities or by providing food in the form of a toxic bait. Since meadow and pine mice are creatures of different habits, control methods differ for each.

Zinc phosphide-treated grains still are the best means for controlling orchard mice. For controlling meadow mice, apply the bait either by the Trail Builder Machine or broadcasting by hand or with a seeder. Six to ten pounds per acre are recommended. All sections of the orchard containing meadow mice should be treated EARLY IN THE FALL! DO NOT WAIT UNTIL THE SNOW FLIES! For extra protection, a buffer zone should be baited around each block of trees to intercept any migrating mice. In areas where the meadow mouse population was high in the fall, a supplemental baiting may be necessary during the winter. Hand placing baits in runways, or broadcasting apple cubes treated with zinc phosphide rodenticide, are good follow-up methods.

A further supplement to meadow mouse control is the removing of grass and weeds in the orchard. Meadow mice like to move in heavy cover and hesitate to move in exposed areas. Periodic mowing will keep the grass down; and the application of herbicides around trees will create barren areas which mice will avoid.

Since pine mice are more difficult to control, greater effort needs to be expended. A few animals may be removed by broadcasting baits, but adequate control will not be obtained. The control of vegetation may not have any effect because of the animal's underground living habits. To obtain control, ZINC PHOSPHIDE-TREATED BAITS MUST BE PLACED IN THE UNDERGROUND TRAILS. Hand baiting is good for small areas, but the Trail Builder Machine is best on large areas. By making trails with the Trail Builder Machine on 2 or 4 sides of the trees, a great number of natural trails will be intersected. This allows access to bait in the artificial trails. The machine should be operated so that the trail is located about 2 feet inside the drip line.

Most Trail Builder Machines, which are commercially available, are equipped with automatic dispensers which place 35-45 baits per tree. Whether baiting by hand or machine, care must be used to keep the trails free of debris and dirt. Pine mice maintain clean, well-packed trails and will remove all extra dirt and debris and may remove the bait with it. In areas of high pine mouse concentrations, a second baiting with zinc phosphide-treated apple cubes may be necessary.

Information on Trail Builder Machines may be obtained by writing this office. Zinc phosphide-treated steamed crushed oats, in 10- and 50-pound bags, and zinc phosphide rodenticide, in 1-ounce cans, are available at Farmer Cooperatives as well as by writing to:

WILDLIFE SERVICES FUND
451 Russell Street
Hadley, Massachusetts 01035

PLEASE NOTE that after more than 35 years, the office of the U.S. Fish and Wildlife Service (which includes the Wildlife Services Fund formerly known as the Rodent Control Fund) has moved off the University of Massachusetts Campus. It is located directly across from the Campus Shopping Plaza at the Hadley/Amherst line on Route 9. The telephone number will remain the same: 413/549-1252.

****

All pesticides mentioned in this publication are registered and cleared for the suggested use in accordance with Federal and State laws and regulations. Where trade names are used for identification, no product endorsement or discrimination is intended.

WARNING! MOST PESTICIDES ARE POISONOUS. READ AND FOLLOW ALL DIRECTIONS AND SAFETY PRECAUTIONS ON LABELS. HANDLE CAREFULLY AND STORE IN ORIGINAL CONTAINERS OUT OF REACH OF CHILDREN, PETS AND LIVESTOCK. DISPOSE OF EMPTY CONTAINERS RIGHT AWAY, IN A SAFE MANNER AND PLACE. DO NOT CONTAMINATE FORAGE, STREAMS OR PONDS.

Cooperative Extension Service
University of Massachusetts
Amherst, Massachusetts
A. A. Spielman
Director
Cooperative Agricultural Extension Work
Acts of May 8 and June 30, 1914
—
Official Business
497 — 9/69 — 1000
Permit No. 1216

Postage and Fees Paid
United States Department of Agriculture

FRUIT NOTES

Prepored by the Department of Plant and Soil Sciences
Cooperative Extension Service
College of Agriculture
University of Massachusetts, Amherst

EDITORS

W. J. LORD AND W. J. BRAMLAGE

NOVEMBER–DECEMBER 1969

TABLE OF CONTENTS

Issued by the Cooperative Extension Service, A. A. Spielman, Dean and Director, in furtherance of the Acts of May 8 and June 30, 1914; University of Massachusetts, United States Department of Agriculture and County Extension Services cooperating.

STORAGE OF PESTICIDES

Gary L. Jensen
Asst. Professor of Entomology
University of Massachusetts

Pesticides should always be stored in a locked dry cupboard or storage shed away from food or feed, where people (especially children), pets or livestock cannot come into unauthorized contact with them.

Always store the pesticides in their original, labeled containers. Pesticides stored in old bottles or food containers might be mistaken for food or drink for humans or animals, or misidentified and improperly used as pesticides.

Pesticide containers should be tightly closed when not in use and should be periodically checked for leaks, tears, breaks, etc. so that faulty containers may be disposed of or replaced before they constitute a hazard.

(Caution: Do not store weed killers, herbicides or defoliants in the same room with insecticides. Volatile materials such as 2,4-D and its derivatives can contaminate other pesticides. Chlorate salts can create fire or explosion hazards.)

Remove only the amount of pesticides needed for one day's operation and be sure to return empty containers and any unused pesticides to the storage area at the end of each day.

Exhaust fans should be installed in storage sheds to provide ventilation and hold temperatures down. Avoid working or engaging in other activities in poorly ventilated storage areas.

Many chemicals are extremely flammable and should not be stored near heat or open flames. When purchasing a pesticide, check the label for any warnings and store such chemicals in accordance with directions.

Fires involving organophosphorous and carbamate insecticides are extremely hazardous to firemen and others in the vicinity. To reduce such personal hazards the following recommendations are given.

1. Label plainly storage areas on all sides with such words as "Danger", "Pesticide Storage" or "Poison"

2. Locate such storage facilities as far away from dwellings and populated areas as possible.

3. Keep the storage facility locked when not in use, to reduce the possibilities of fires set by man.

4. Keep the fire departments and hospitals informed as to the nature and hazards these compounds may present in the event of fire. The fire chief should be furnished with the phone numbers of people responsible for the pesticide storage facility.

5. Evacuate persons near such fires, who may come in contact with toxic smoke and fumes from the fire.

****

NEW STORAGE HANDBOOK AVAILABLE

William J. Bramlage
Department of Plant and Soil Sciences

The U.S. Department of Agriculture has recently published a revision of its Agricultural Handbook No. 66, "The Commercial Storage of Fruits, Vegetables, and Florist and Nursery Stocks." The scope of the publication is aptly described in its introduction: "This handbook presents brief summaries of the essential average storage requirements of fresh fruits, vegetables, cut flowers and certain other horticultural crops. Many details are necessarily ommittedas the handbook is intended primarily for general practical reference. The conditions given should not be considered absolute or final but rather as the safe limitations under which the various products can ordinarily be stored."

The handbook begins with a general discussion of factors involved in cold storage, then lists the individual needs of numerous fresh fruits and vegetables, and concludes with a more general description of the needs of floricultural and ornamental crops (due to the general lack of specific information for these crops). Originally published in 1954, this handbook quickly became a standard reference for post-harvest requirements of horticultural crops. The revised copy now up-dates the original information as well as adds a number of commodities to the described lists.

Everyone involved with the handling of fresh horticultural products will find this handbook useful, and indeed the information in it can often be critical. U.S.D.A. Handbook No. 66 is available from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20420. It is "For Sale Only," the cost being $1.00. We strongly recommend that you send for a copy.

****

THE PRICE IS RIGHT

W.D. Downey
Department of Agricultural Economics
Purdue University

There are a number of things that can make a roadside market financially successful; its location, its reputation, its products, its employees, etc. But none of these is really enough without the right price. It's the selling price that generates income and profit.

Of course, the price alone is only half the picture. Volume is an essential element of successful retailing. Like love and marriage, both the proper price and sufficient volume go together to make a successful venture.

Let's explore how these work together and, in particular, some particular aspects of establishing a price policy.

Pricing--A Particular Problem In Roadside Markets

The very nature of roadside markets makes their pricing problem unique. The wide variety of merchandise, ranging from jumbo Texas grapefruit to ceramic bird baths and scenic murals of Yellowstone Falls, makes for a complex pricing problem--or should we say opportunity? This very factor can be a distinct advantage in establishing a pricing policy leading to excellent profits.

In the first place, the typical roadside market has little direct competition. True, there may be one or two other roadside markets in the area, but these are often on the other side of town. And even then, it is relatively easy for the aggressive roadside marketer to clearly distinguish himself.

Although the supermarket sells some of the same products (fresh fruits and vegetables), they are really in another ballgame. The roadside market can and should sell an entirely different product. Clearly, a 39 cent plastic bag of Florida oranges is an entirely different product than jumbo California navels ready for customer selection. The roadside marketer is a specialist and should capitalize on this--not to mention the wide variety of hard goods merchandise in the roadside market to tickle the fancy of shoppers.

Being a unique type of retailer, the roadside marketer has special problems of seasonality. This may be due partly to the types of products he handles but is probably more closely tied to the weather and the customers' reactions to it. The roadside marketer may use his pricing policy as a technique of evening out and lengthening the busy season.

Capitalize on Uniqueness

The special quality in fruits and vegetables already mentioned is only one unique aspect of the roadside market. The roadside market offers shoppers an exciting and pleasant change from the hustle-bustle of the busy supermarket. The shopper may be attracted to the personalized service, friendly comments and suggestions, and general atmosphere of the market. The wide variety of gadgets, novelties, and decorative home furnishings adds a dimension to the shopping experience not generally available. The roadside market is the perfect excuse for a Sunday drive or evening diversion.

These unique characteristics are important to the pricing policy of the roadside market. These qualities clearly put the roadside market in a class by itself.

Things to Remember About the Consumer

That consumer--the fellow you hope will pay the price you're asking--is a very interesting creature. For instance, even though he complains bitterly about the prices he pays, he remembers prices of only a few frequently purchased items. And even when they come with a very specific purchase in mind, they are easily influenced to buy more than they came in for. As a matter of fact, about two-thirds of all purchases are decided at the point of purchase.

Consumers, being human, have a real need for recognition. They like to enjoy their shopping experiences. Yet they like to think they are very thrifty and price-conscious. They like to have an excuse for going to the roadside market--to save money.

These facts about consumers give us clues to establishing prices. They can be attracted to your market by low prices but can also be influenced once there to consider many other products.

The Volume Side

Traffic is essential to success of a roadside market. By traffic, we mean getting people into the market itself. You certainly can't sell much if you can't get people to come in. And so, one of the important roles that price can play is getting people into your place of business.

Low prices on good quality merchandise has proven a very effective way of attracting customers. It may actually pay to offer attractive merchandise at a price so low that it does not cover its full cost--just to attract customers into the market. The idea is that once people are in the market they can be enticed to purchase other merchandise not on "special" and the net result will be a higher dollar profit for the market.

A necessary part of traffic-building specials is point-of-sale promotions in the market on items that are not "on sale." A very attractive display of top grade eating apples near the "special" priced cooking apples should increase the sale of eating apples as well--not to mention that jar of maple syrup the shopper picked up.

We said earlier that customers really need a reason for making a special stop at a roadside market. The "special" can be just the excuse she needs. The customer can shop with a very good feeling about the money she is saving. And the savings is often a justification for her to buy something else that struck her fancy.

Don't overlook the value of getting the customer into a habit or routine of visiting your market. Consistent specials are a fine way of establishing shopping habits. So, come spring and he needs grass seed, it is perfectly natural for him to consider your market first. Because it's easy to develop a more personal relationship with regular customers, specials tend to build a steady trade.

Don't Overlook Expense Control

Expense control is another fine way of improving your profit position. What has this got to do with setting price? Answer--a great deal. Good pricing techniques can increase volume of sales and lower costs! Let's look more closely at this idea.

For any roadside market, in the short run--say a week or even a month--almost all expenses are fixed. That is, rent, electricity, labor, maintenance, etc., are about the same regardless of how much you sell.

Breakeven Pricing

A very simple yet powerful tool overlooked by retailers in pricing problems is breakeven analysis. Breakeven analysis is a method of determining what volume a market must sell in order to break even--or the point at which you begin to make a profit. It is a systematic way of looking at the relationships that exist between volume and prices. Let's look more closely at this powerful tool.

First, we must recognize that there are two basic types of costs. Fixed costs are constant no matter how much is sold. Fixed costs are generally easily identified. Usually salary, wages, rent, taxes, insurance, and interest are fixed costs. For the most part, advertising and utilities are fixed costs too, because they don't vary much with the level of sales. It's also relatively easy to put these fixed costs on a convenient time period, say per week. For example, let's assume our fixed costs per week add up to $300.

The second kind of costs are variable costs. Variable costs vary directly with the level of sales. The more you sell, the

higher the total variable costs. A good example is the wholesale cost of goods you are selling. Each time you sell one more you have the initial cost of that item to cover.

Now the important point to remember is that you have fixed costs no matter how many you sell--even if you don't sell any. But variable costs increase proportionally.

Now let's begin in price. Every time we sell one pound of fancy apples, we generate say 25¢. That 25¢ must be used for three things. It must cover the wholesale cost of the apple (variable cost), say 15¢. The remaining 10¢ must help cover some of the fixed cost of running the business. And if any is left over, it goes to profit. The 10¢ remaining is what we might call a <u>contribution to overhead</u> and profit.

Just to make it simple, let's assume we are only selling apples. The first pound of apples we sell will cover the variable cost of the apple and 10¢ of the $300 fixed cost. Question--how many pounds of apples do we need to sell to exactly cover all costs? Answer--since each pound sold for 25¢ contributes 10¢ to overhead, then $300/.10 - 3000 pounds of apples. That's a lot of apple pie! And you would have to sell this much before you could even make one penny profit. That's what we call the breakeven point.

That was an awfully simple example. But it works about as simply for a market that sells a wide variety of produce--especially when you think in terms of the margin you make on each dollar of sales. Let's say that each item you sell is priced so that you make a 40 percent margin. This means, of course, that for every dollar of sales, 60¢, or 60 percent, goes for the cost of the goods, and the remaining 40¢, or 40 percent, is for covering overhead and profit. Note that for the most part the margin you set is really the same thing as the "contribution to overhead" (CTO) that we discussed earlier. So it is easy to calculate the amount of sales you must make to break even by:

$$\frac{\text{fixed cost}}{\text{CTO}} - \frac{\$300}{.40} = \$750 \text{ sales}$$

If you cut your prices and sell at a 30 percent margin, then CTO becomes 30¢ of every dollar of sales, so:

$$\frac{\text{fixed cost}}{\text{CTO}} - \frac{\$300}{.30} = \$1000 \text{ sales}$$

This shows you very effectively what must happen to your level of sales when you change your margins. If, by lowering your margins, you can increase your sales by more than enough to offset the lower CTO, then it may pay you to do this. But if you don't think the higher sales figure needed is realistic or feasible, you'd better think twice before lowering margins.

By treating a desired profit level as a fixed cost, you can determine what level of sales you need to reach that profit goal. Let's say your goal is $100 profit per week with a 40 percent margin. Then:

$$\frac{\text{fixed cost + desired profit}}{\text{CTO}} = \frac{300 + 100}{.40} = \frac{400}{.40} = \$1000 \text{ sales}$$

Breakeven or volume cost analysis is a simple way of understanding relationships of volume and prices. To the extent you can accurately identify your costs, it is an excellent tool in planning profit.

So if you can sell say twice as much, your cost of selling for each dollar of sales will be only about half as much. The result is that by reducing unit costs substantially you can significantly increase the profit. Business experts call this "spreading fixed costs."

This holds true particularly with perishable commodities since once purchased or grown they must be sold in a short period or you will experience considerable loss. In this case, even the cost of goods represents a fixed cost once they are purchased. The same concept holds true for all merchandise except where the product is not perishable. In this case, the cost of the product does not represent a fixed cost to the market but a variable cost.

Let's take an example. Suppose all costs of operating a roadside market except for cost of goods sold run about $300 per week. This includes wages and salary, supplies, utilities, taxes, insurance, etc. Further, suppose our sales are $1000 for the week and that cost of goods sold is $600. The result is $100 profit--not bad. But if we could increase sales to $1500 with a cost of goods of $1000, with fixed cost still at $300, then profits would be up to $200, a very significant change.

Of course, it may be necessary to lower prices on some items to do this, but so long as you can boost sales by more than enough to offset the price decrease you improve your profit picture.

We're not suggesting lowering prices on all items--only on some items. The idea is to increase traffic in the store and consequently sales volume. This ties in with doing a good job merchandising in the store. When customers come in for the specials, you should aggressively promote other items. Lowering unit costs by increasing volume is an effective tool, especially when used with "in-market" promotions.

Prices Must Be Advertised

Using prices as a merchandising technique will be ineffective if customers don't know about it. Consumers can only be motivated

by things they know about. So effective advertising is essential to the successful use of prices to increase volume.

Yes, advertising is expensive. Yet it is a necessary element of this type of program. It need not be elaborate, but it must be effective. Certainly the "specials" must be advertised. But don't overlook advertising and promoting other things as well. New shipments of particularly exotic merchandise and special services of the business should be promoted along with the specials.

Methods of Pricing

Straight Markup

Probably the easiest and simplest method of pricing is adding a certain percentage to the cost of the merchandise. That is, if bananas are purchased for 10¢ per pound and a markup of 40 percent to cover costs and give a profit is desired, (40% X 10¢ = 4¢) 10¢ + 4¢ = 14¢ per pound would be the selling price. This is a clear-cut method that can work quickly for all merchandise purchased.

For homegrown produce the problem is not so simple. Since the cost of producing the produce is usually not known accurately, it is not possible to add a markup. One alternative, however, is to get wholesale prices from a produce broker or through market news reports.

This system also requires some knowledge of your costs. Remember the markup must represent an amount to cover selling expenses and leave the desired profit. In the case of a roadside market, the actual percentage of expenses may be determined from last year's records. But where records are not available or are inseparable from the production expenses, even the expense measures are difficult to obtain. Of course, this points up the importance of keeping records. If you are not sure what your expenses are, it is difficult to know how much profit (or loss) you are making or where it's coming from.

Competitive Pricing

Another common method of pricing is called competitive pricing. As the name implies, you price according to the going rate in the market, that is, whatever the market will bear. Rather than concerning yourself with expenses, you let your competitors determine the price for you.

In the case of homegrown produce, this method makes sense because the produce represents a fixed or sunken cost. Assuming the going price is high enough to pay for the harvesting and selling, the grower wants to at least recoup part of his production costs. Even if he doesn't know precisely what they are, he will be better off to recover what he can.

Here again, don't forget that homegrown produce or "fancy" quality may be an entirely different product than that displayed in supermarkets. Consequently, prices charged at roadside markets need not directly compete with the supermarket produce. The roadside marketer may ask and get a premium on some of his produce.

Pricing By Nines

Another consideration in pricing that has been used by a wide variety of retailers is pricing goods at prices ending in "9." This is based on a hopeful psychological reaction of customers that 39¢ sounds like so much less than 40¢, or $1.99 so much less than $2.00. This practice is very widespread and probably holds some degree of truth. In fact, many retailers add whatever margin they feel they must have and then round that figure to the nearest nine.

One reason why some small retailers resist "pricing by nines" is that it is more difficult and takes more time to make change with these uneven numbers. But with the advent of the sales tax, the total sale price seldom comes out even anyway.

A type of pricing that has similar psychological appeal to consumers is the "two for..." system. This is often combined with pricing by nines to come up with 15¢ or 2 for 29¢. Shoppers often can be enticed to increase their purchases by this mechanism. This appeals to their need to be thrifty. It seems like a bargain, and bargains always make a shopper feel good.

One Price--Multiple Price

A lower price for larger quantities is often used in roadside markets. This is also an effective way to use price to increase sales. An example of this is potatoes selling for 8 cents per pound or 75 cents for a ten pound bag. Usually, it can be argued that it costs less per pound to bag and sell potatoes in quantity units than on a customer selection basis. So to sell larger quantities makes some sense. But in addition, this system should increase total sales and give the benefits of lower fixed cost per unit. Again, we appeal to the shoppers' desire for thrift or a bargain.

Price Lining

Marketers often decide on three different "price lines"--say 39¢, 69¢, and 99¢--and then fit all of a particular type of produce into one of the three categories. Price lining is frequently used for pricing certain lines of produce. Good examples are pumpkins, Indian corn, and gourds. This method has much consumer appeal and may also be effective for selling non-produce merchandise. It is a relatively simple system. But consumers get used to certain prices, and it is more difficult to change the price as wholesale prices change.

Meeting Price Competition

An essential aspect of pricing, no matter how you decide on them, is to be aware of the retail prices of your competitors. The alert roadside marketer keeps informed by close and frequent checks on price levels in his market area. Since price levels are so important to his success, he makes it his business to stay informed of changes in the market area.

The sharp roadside marketer is also alert to the importance of timing and price changes. The busy season can be extended by changing the product line to include seasonal products. These can be geared to low pricing of specials to increase traffic into the market. This is an effective way of increasing sales and lengthening the selling season.

Prices--Volume--A Total Picture

By this point, it should be clear that the "right" price is both a combination of covering costs and generating sufficient sales. A high price does not mean more profit unless it is capable of generating sufficient sales. By the same token, lowering produce price to generate volume makes no sense if you are not covering costs. But there is a happy medium--the proper combination of price level and sales volume--the "right price." The right price may vary from product to product and often requires some experimentation to find it.

The use of advertised "specials" to increase traffic in the roadside market makes a great deal of sense--especially when tied to effective point of sale promotions on non-special merchandise. Increased traffic should increase sales more than enough to offset loss in revenue of products sold at "special" prices.

Many different methods may be used by roadside marketers to set specific prices. Competitive pricing, straight markup, pricing by nines, and price lining are among these. But no matter what specific method is used, the roadside marketer should identify his unique characteristics and capitalize on them. Special high quality produce, personalized service, and the shopping environment may mean the roadside market can ask a premium and get it. The roadside marketer should take the lead in pricing his product and certainly not approach this important problem haphazardly.

****

POMOLOGICAL PARAGRAPHS

"U Pick" method of harvesting small fruit: It is the opinion of the writer that commercial growers and part-time farmers in south-

ern New England in general, are failing to capitalize fully on the advantages of the "U Pick" method of marketing small fruits. Although the "U Pick" method of harvesting strawberries has been popular with Massachusetts growers for a number of years, acreage devoted to this crop has continued to decline. On the other hand, Professor Klingbeil, Extension Horticulturist, University of Wisconsin, recently stated that the "U Pick" method of strawberry marketing and virus-free varieties saved this industry in his state! (Proceedings 121st Annual Meeting, Ohio State Horticultural Society). The acreage devoted to strawberries had declined to nearly 1,000 acres and further reduction was imminent. Currently an excess of 2,000 acres of strawberries are harvested in Wisconsin and 98% of the fruit are picked by the "U Pick" method.

Weed Control Trials in California: Pre-emergence weed control trials in young deciduous fruit tree plantings in California showed that the greatest variation in response resulted from differences in location and that differences among fruit species or even among herbicides often was relatively insignificant in comparison with location differences. However, on a pound-for-pound basis, diuron generally was safer than simazine with most species. Peach trees were more resistant to uracils (for example, terbacil) than to simazine and diuron.--From Journal of the American Society for Horticultural Science, Vol. 94 (No. 1): pp. 57-60.

Publications Available: Available from The Pennsylvania State University Agricultural Experiment Station, University Park, Pennsylvania, is Progress Report 294, entitled "Calibration of Airblast Sprayers for Use on Deciduous Fruits." In this publication, a formula, along with supporting examples and data tables, is presented to help growers calibrate airblast sprayers correctly for applying concentrate sprays to fruit trees.

Virginia Polytechnic Institute has recently revised their publication on thinning of peaches which discusses various thinning procedures including their experiences with chemical thinners and mechanical shakers. This publication, "Thinning of Peaches" (Publication 280) can be obtained by writing the Cooperative Extension Service, Virginia Polytechnic Institute, Blacksburg, Virginia 24061.

The U.S. Department of Agriculture has recently published Home and Garden Bulletin No. 161 entitled "Apples in Appealing Ways." The bulletin is aimed at the homemaker and gives tips on variety uses, storing apples and gives several recipes for using apples. This publication should be of interest to homemakers, and roadside stand operators may wish to bring the availability of this publication to the attention of their customers. This publication may be obtained for 15 cents by writing to the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

****

Cooperative Extension Service
University of Massachusetts
Amherst, Massachusetts
A. A. Spielman
Director
Cooperative Agricultural Extension Work
Acts of May 8 and June 30, 1914

Official Business
504 — 11/69 — 990
Permit No. 1216

Postage and Fees Paid
United States Department of Agriculture

FRUIT NOTES

Prepared by the Department of Plant and Soil Sciences
Cooperative Extension Service
College of Agriculture
University of Massachusetts, Amherst

EDITORS

W. J. LORD AND W. J. BRAMLAGE

JANUARY–FEBRUARY 1970

TABLE OF CONTENTS

Issued by the Cooperative Extension Service, A. A. Spielman, Dean and Director, in furtherance of the Acts of May 8 and June 30, 1914; University of Massachusetts, United States Department of Agriculture and County Extension Services cooperating.

EARLY RIPENING APPLE VARIETIES

James F. Anderson
Department of Plant and Soil Sciences

There appears to be increasing interest in early-ripening apple varieties, particularly by those growers operating retail sales outlets. Comments on some of the newer sorts are given below. All of the varieties discussed are now growing at our Belchertown facility but two have not fruited as yet, comments on these varieties will be based on performance in other areas. All of these trees are too young to evaluate as to yield potential.

Julyred

This New Jersey introduction was harvested during the first week of August at Horticultural Research Center. The fruits are of medium size (2 1/2" +), medium red and have a bright, smooth finish. The eating quality was very good for an apple of this season. The handling and keeping qualities are very good. Julyred appears to be very promising.

New Jersey #36

We fruited one tree of this selection last summer. The fruit ripened in late July. The fruit is very attractive with bright, smooth finish and medium red color. This selection was at least equal to Julyred in this initial comparison under our conditions.

Quinte

This variety has yet to fruit in our orchard. The fruit of this Canadian introduction ripens 7 to 10 days before Melba, has a yellow skin overlaid with an attractive red blush and is equal to Melba in quality. Under good growing conditions, an average of 80% of the skin is red. Quinte will probably require thinning to get good size and spot picking may be necessary.

Tydeman's Early (Tydeman's Red)

An English variety from a cross of McIntosh and Worcester Pearmain. This variety, ripening in late August, is similar to McIntosh in appearance, but is said to average larger in size. The apples have a green undercolor and are overlaid with a medium-red blush. The fruit has good quality and looks promising for the early fall trade. Tydeman's Early has a habit of growth similar to Rome.

Summerred

A new introduction from British Columbia. Summerred is said to ripen in late August. The fruits are described as attractive and excellent in flavor. The skin is highly colored with a bright solid red blush. The texture is fine, crisp, juicy and moderately firm.

Niagara

This introduction from New York ripens about 10 days before McIntosh. Niagara is similar to McIntosh in shape and color, but the fruit from our young trees have tended to be larger in size. The color and finish has been less than satisfactory the past two seasons. The fruit seems more susceptible to russeting and the dots or lenticels have tended to be larger and blurred. Reports on Niagara from other sources have been more favorable and our poor response may be due to local conditions.

With these newly introduced varieties and the standard sorts such as Red Melba, Puritan and Early McIntosh, the grower has an excellent selection of varieties to satisfy his late summer and early fall trade.

****

RECENT APPLE VARIETY INTRODUCTIONS

James F. Anderson
Department of Plant and Soil Sciences

Empire

A very promising introduction from the New York Agricultural Experiment Station at Geneva. Empire, resulting from a McIntosh and Delicious cross, was introduced in 1966. The fruit ripens about 2 weeks later than McIntosh. This very attractive apple has a solid red color, medium size and very good dessert quality. The fruit hangs well on the tree. Empire is said to be annual, productive and a good keeper. We have only one year's experience with this variety but it appears to be most promising.

Sungold

A seedling discovered in Bridgeton, New Jersey. Sungold is a russet-free Golden Delicious type. The fruit produced in our plantings have a stem end similar to Golden Delcious and a calyx end resembling Red Delicious and are more conical in shape than Golden Delicious fruits produced on adjacent trees. The flesh color and quality resemble Golden Delicious. Sungold has been relatively russet-free, except for the lenticels, in our 1968 and 1969 trials. Sungold appears to ripen a few days earlier than Golden Delicious.

Wayne

This variety resulted from a Northwestern Greening and Red Spy cross and was introduced by the New York Agricultural Experiment Station in 1962. The fruits are large, with a scarlet blush and have good dessert quality. The trees in our Belchertown plantings have been very productive. Wayne ripens with Cortland and hangs well on the tree. This late blooming variety may have a place where a dual purpose apple is desired.

RECENT PEACH INTRODUCTIONS

James F. Anderson
Department of Plant and Soil Sciences

The following are comments on some of the new peach introductions currently being grown at the Horticultural Research Center. Though most of these have fruited once or twice, our observations have been limited and the descriptions are based primarily on those given by the originator. The performance of these varieties under Massachusetts conditions may or may not be similar to that in their place of origin. The varieties are listed in approximate order of ripening.

Collins

A New Jersey introduction ripening a few days before Sunrise. The peach is medium-sized, firm and yellow fleshed. Collins is semi-cling when picked at maximum shipping condition and a freestone when fully matured. Thinning is recommended to insure good size.

Sunrise

An attractive, yellow-fleshed peach of medium size. It is firm and almost a freestone when ripe.

Golden Dawn

A seedling peach that was discovered in the Bolton orchard of Jonathan Davis in 1953. It is a yellow-fleshed peach of high quality which ripens about the time of Erly-Red-Fre.

Reliance

An introduction from the New Hampshire Agricultural Experiment Station is said to be extremely bud hardy. It is reported to have survived minimum temperatures of -25°F. The fruit is nearly round, moderately fuzzy and has a dull red color. The bright yellow flesh is juicy, medium firm, slightly stringy, of good flavor and ripens with Golden Jubilee.

Goldgem

A large yellow-fleshed peach that ripens at the same time as Golden Jubilee. It is much firmer and more attractive than Golden Jubilee. It does not have the solid red of Redhaven, but it is easier to grow and tends to run larger in size.

Washington

One of a new series of introductions from the Virginia Polytechnic Institute (V.P.I.). Its flowers are reported to be extremely tolerant of spring frosts. The fruits are round, ovate in shape and a high percentage of the skin is covered with a bright red. The flesh is orange-yellow with bright red at the pit. The flesh is fine textured and it resembles Sunhigh in flavor. This variety ripens about 3 weeks before Elberta.

Summerqueen

A large, attractive, firm, yellow-fleshed peach of excellent quality. This New Jersey introduction ripens with Sunhigh. It is less susceptible to bacterial spot than Sunhigh. Summerqueen requires cross-pollination.

Redqueen

Was selected by the New Jersey Agricultural Experiment Station because of its bud hardiness. The fruit is large, well colored and of good quality. It is equal to Elberta in shelf life and firmness. Redqueen ripens about 14 days before Elberta.

Madison

One of the most frost resistant introductions from V.P.I. The fruit has medium size and is highly colored. The pubescence is short and the fruit is above average in attractiveness. The flesh is yellow, firm, juicy and has a mild, rich flavor. Madison ripens about a week before Elberta.

Jerseyqueen

A New Jersey selection introduced to replace Elberta. Jerseyqueen ripens a few days later than Elberta. The fruits are large, round and well-colored. The flesh is yellow, firm and excellent dessert quality. The variety handles and stores very well.

Jefferson

Another V.P.I. introduction with blossoms that are resistant to spring frosts. The fruits are large and well-colored. The flesh is yellow and comparable to J.H. Hale in flavor and firmness. Jefferson ripens 2 to 3 days after Elberta.

****

RECENT SMALL FRUIT INTRODUCTIONS

James F. Anderson
Department of Plant and Soil Sciences

The following report briefly describes some of the recent small fruit introductions that might be of interest to both commercial growers and backyard gardeners.

Strawberries

Sunrise

An early ripening red stele resistant variety developed cooperatively by the Maryland Agricultural Experiment Station and the United States Department of Agriculture. The variety was introduced in 1964.

Sunrise is resistant to 3 races of the red stele fungus and to verticillium wilt. The leaves are resistant to leaf scorch and mildew. The leaves are said to be very susceptible to leaf spot, but we have experienced no difficulty with this disease in our trials.

We fruited Sunrise in our experimental plot in Amherst in 1958, 1959, 1960 and 1961 and at our Belchertown facility in 1968 and 1969.

The berries are glossy, light red, smooth, uniform in shape and the size ranges from medium to small. The berries color evenly and are easy to pick. The plants are vigorous and make a good bed, the yield might be considered fair. Sunrise might have a place because of its early season and its resistance to red stele and verticillium.

Raritan

A new midseason strawberry variety was named and introduced by the New Jersey Agricultural Experiment Station in February, 1968.

Raritan was fruited in our trials in 1962, 1967, 1968 and 1969. This variety produces very attractive fruit having a high gloss, bright red color, depressed yellow achenes and a large showy calyx. The berry size was variable, ranging from large to medium. The fruit is firm, has good flesh color and a very good strawberry flavor

The plants produce runners freely and make a good matted row. Yield records in 1962 and 1967, would suggest Raritan to be a productive variety (Yield records were not obtained for Raritan in 1968 or 1969).

Raritan is not resistant to red stele or verticillium wilt and is recommended for trial only in fields free of these disorders.

Redchief

This midseason strawberry variety was released in February, 1968, by the Maryland Agricultural Experiment Station and the Crops Division of the U.S.D.A Redchief was included in our variety trials for 1965, 1966, 1967 and 1968.

The fruit is attractive with a medium red color, bright gloss, large reflexed calyx and is above medium in size. The berries are firm, have good internal color and good dessert quality.

The plants are of moderate vigor and produce runners in sufficient quantities to make a good matted row. Redchief has yielded very well in our past trials, usually among the top three or four producers.

Redchief is resistant to 5 races of red stele and intermediate in resistance to verticillium and would be of value where these disorders are present. Redchief is worthy of trial.

Guardian
This is a sister seedling of Redchief, introduced by the Maryland Agricultural Experiment Station and the United States Department of Agriculture in 1969.

Guardian was included in our 1968 and 1969 variety trials. It ripens just ahead of Catskill. The berries are large, glossy and have a light red color. The berries have tended to be rough in outline, with many furrowed berries and it also is inclined to neck and have green tips. The flesh is firm and has a good strawberry flavor, but it tends to be too light in internal color. The berries have not been especially attractive.

The plants of Guardian have good vigor and form a good bed. The yield has been satisfactory under our conditions. Guardian plants are resistant to 5 races of red stele and highly resistant to verticillium. Its leaves are moderately susceptible to leaf spot, but show resistance to mildew and leaf scorch.

Guardian is worthy of trial where red stele and verticillium are troublesome.

Since the performance of a strawberry variety is greatly influenced by climatic, soil and cultural conditions, it is suggested that growers test any new variety on a small scale before planting it on a commercial basis.

Red Raspberries

The Maryland Agricultural Experiment Station has introduced a number of new raspberry varieties that may be of value in Massachusetts. None of the varieties listed has been tested in our plantings, but they are being mentioned because of their reported resistence to injury from fluctuating winter temperatures, a factor of some importance in Massachusetts. These descriptions are based on their performance in Maryland.

Reveille
A very early ripening variety, Reveille resembles Sunrise and is of the same season. It is much larger, has excellent color and quality. It is too soft for commercial use, but its size and earliness makes it excellent for home or roadside sales.

Sentry
An early midseason variety, the berries are firm, medium red in color and high in quality. Resembles Taylor. This variety has greater resistance to injury from fluctuating winter temperatures.

Scepter
Resembles September with the fall crop being ten days earlier. The spring crop is midseason. The berries are large, medium red and moderately soft. It is very vigorous.

Citadel

A large midseason variety, very large, very firm and dark red. It may pick with difficulty under some conditions. It is extremely vigorous and highly resistant to leaf-spot diseases.

The above four raspberry varieties are available in limited quantities as "Registered Stock" or "Foundation Stock" from nurseries specializing in the propagation of "virus-free" raspberry plants.

****

DWARF FRUIT TREE ASSOCIATION ANNUAL CONFERENCE

Duane W. Greene
Department of Plant and Soil Sciences

The 13th annual conference of the Dwarf Fruit Tree Association will be held March 2 and 3, 1970, at the Statler-Hilton Inn, Benton Harbor, Michigan. The general theme of this year's conference is "How to Live with Compact Trees." The first morning has been tentatively set aside for observing different orchard types and tree training systems in Southwest Michigan. One of the noted speakers will be A.P. (Tony) Preston from the East Malling Research Station, England. Tony is recognized for his knowledge of rootstock behavior.

Further information concerning this conference is available from Dr. Robert Carlson, Department of Horticulture, Michigan State University, East Lansing, Michigan. Those interested in attending can make reservations by contacting the Statler-Hilton Inn, Benton Harbor, Michigan.

****

NEW INSECTICIDES IN THE 1970 RECOMMENDATIONS

Gary L. Jensen
Ass't. Professor of Entomology
University of Massachusetts

Several of the "HARD" or PERSISTENT PESTICIDES are being omitted from the 1970 Fruit Spray Guides. Three chlorinated hydrocarbons which will not be recommended are DDT, lindane, and dieldrin. Although DDT is the most effective insectide against the tarnished plant bug, there are others which can be used. Dieldrin has been effective against several pests but here also there are materials which may be substituted. The Commonwealth of Massachusetts now forbids the use of DDT out-of-doors, and as soon as effective substitutes are developed, many of the other chlorinated hydrocarbons will also be eliminated.

Three new organic phosphate insectides, Gardona*, Imidan*, and phosalone (Zolone*), are now registered for use on apples and will be recommended in the 1970 Apple Spray Recommendations. A fourth new material, Omite*, which is a sulfite acaracide, will also be included in these recommendations.

Gardona*: Gardona* is a non-systemic material which has been shown to be effective in controlling a number of apple insect pests including apple maggots, plum curculio, red-banded leaf roller, European apple sawfly, and fruit tree leaf roller. Sold as a 75% wettable powder, Gardona* is less toxic to warm-blooded animals than many of the other phosphate materials; however, it should be handled with care and all precautions listed on the label should be carefully observed.

Gardona* has been applied to several apple varieties, including McIntosh, Rome, Jonathan, Winesap, Stayman, York, Cortland, Northern Spy, Gravenstein, R.I. Greening, Baldwin, Wealthy, and Grimes Golden, without injury to the fruit. Under New York State conditions, however, Golden Delicious sprayed with Gardona* have shown a tendency to russet, hence its use on this variety is ill-advised.

Imidan*: This material, sold as a 50% wettable powder, is effective against many of the same apple pests as Gardona*, and is also much safer than many of the other organic phosphates; however, here also it is recommended that this material be used with caution. When used in a seasonal program, Imidan* has been shown to suppress both the European red mite and two-spotted mite and green apple aphids.

Phosalone (Zolone*): Phosalone is also a phosphate compound with a relatively low mammalian toxicity. A non-systemic, it has proven to be effective against a broad spectrum of fruit insects and mites on apples, pears and grapes. It is marketed as an emulsifiable concentrate containing three pounds of phosalone per gallon. Although phosalone has been effective in controlling mites in many areas, reliable work done at the Experiment Station at Geneva, New York, has shown this material to be ineffective against the two-spotted mite populations in that area. Red mites proved to be susceptible for the first year or two, but then resistance developed. Phosalone is not effective against phosphate-resistant populations of pear psylla.

Golden Delicious and other yellow varieties may exhibit some russeting following the application of phosalone in some areas.

Omite*: A broad spectrum acaracide, Omite* has been shown to be effective against the European red mite, the McDaniel mite, Pacific spider mite, peach silver mite and the two-spotted mite. Since Omite* is not a systemic material, complete coverage of both the

---

*Trade name

upper and lower leaf surfaces and of the fruit is necessary for effective control. Omite* is not an ovicide, that is, it does not kill eggs; however, young mites hatching from the eggs after the material has been applied will be killed by the residue on the leaves.

Omite* is toxic to fish, therefore, great care should be exercised in preventing its entry into any body of water. Additional adverse publicity concerning pesticides is to be abhorred by all growers who wish to continue using them.

****

FRUIT NOTES INDEX FOR 1969

(This index of major articles has been prepared for those who keep a file of Fruit Notes. The number in parentheses indicate the pages on which the item appears.)

---

*Trade name

****

All pesticides mentioned in this publication are registered and cleared for the suggested use in accordance with Federal and State laws and regulations. Where trade names are used for indentification no product endorsement or discrimination is intended.

WARNING! MOST PESTICIDES ARE POISONOUS. READ AND FOLLOW ALL DIRECTIONS AND SAFETY PRECAUTIONS ON LABELS. HANDLE CAREFULLY AND STORE IN ORIGINAL CONTAINERS OUT OF REACH OF CHILDREN, PETS AND LIVESTOCK. DISPOSE OF EMPTY CONTAINERS RIGHT AWAY, IN A SAFE MANNER AND PLACE. DO NOT CONTAMINATE FORAGE, STREAMS OR PONDS.

Cooperative Extension Service
University of Massachusetts
Amherst, Massachusetts
A. A. Spielman
Director
Cooperative Agricultural Extension Work
Acts of May 8 and June 30, 1914
—
Official Business
513 — 1 70 — 1000
Permit No. 1216

Postage and Fees Paid
United States Department of Agriculture

FRUIT NOTES

Prepared by the Department of Plant and Soil Sciences
Cooperative Extension Service
College of Agriculture
University of Massachusetts, Amherst

EDITORS

W. J. LORD AND W. J. BRAMLAGE

MARCH–APRIL, 1970

TABLE OF CONTENTS

Issued by the Cooperative Extension Service, A. A. Spielman, Dean and Director, in furtherance of the Acts of May 8 and June 30, 1914; University of Massachusetts, United States Department of Agriculture and County Extension Services cooperating.

1970 GUIDE TO ORCHARD FERTILIZATION

William J. Lord
Department of Plant and Soil Sciences

Apple Orchards

Nutritional standards: Our basic standards for nutrition of bearing McIntosh apple trees have not changed from the past (Table 1). In the future, however, we may find it desirable to increase our standard for nitrogen (N) level for McIntosh trees because of the wide-spread use of Alar. The maintenance of a higher N level on those trees to receive Alar may improve tree vigor and may help counteract the detrimental effect of Alar on fruit size. However, exactly what is the optimum N level for trees receiving Alar is unknown; until a clearer answer is available, our suggestion is that you try to maintain 2.0%-2.2% N in leaves of mature bearing McIntosh trees.

Table 1. Desirable mineral content of leaves from bearing McIntosh apple trees expressed as percentage dry weight.

Nitrogen (N)	Potassium (K)	Calcium (Ca)	Magnesium (Mg)
1.80 - 2.00	1.25 - 1.60	0.90 - 1.40	0.25 - 0.40

Application rate: In the past, we have suggested the following rates for normal applications to bearing apple trees as a guide in maintaining nutritional standards (Table 2). These suggestions should be adjusted according to the tree vigor and productiveness and fruit color, as experience indicates.

Table 2. Normal rates of fertilizer for bearing apple orchards.

	Approximate amounts per tree					
Potential bu. yield of tree	Nitrogen required	Potash required	Ammonium nitrate	Muriate of potash or	0-15-30	8-16-16
	Pounds	Pounds	Pounds	Pounds	Pounds	Pounds
Less than 15	0.66	1.3	2.0	2.1	4.3	8
15 -25	0.66-1.0	1.3-2.0	2.0-3.3	2.1-3.3	4.3-6.6	8-12
More than 25	1.33-2.0	2.7-4.3	4.0-6.0	4.5-7.9	9.0-14.3	16-25

Application: The suggested amounts in Table 2 are for hand applications under the spread of the branches. When the materials are broadcast over the entire orchard floor, it may be necessary to increase the rate of application in order to obtain the same tree response as with the hand applications. Fertilizer materials other

than those given in the tables may be used so long as they are applied at rates which provide equivalent amounts of N and potassium (K).

A recent study in a mature McIntosh orchard of moderate vigor (1.9-2.1% N) showed that in 3 out of 5 years N and K levels did not differ when fertilizer was either broadcast under the trees, applied in a narrow band at the dripline, or applied in a narrow band within 3 feet of the trunk. During 2 of the 5 years, however, the applications within 3 feet of the trunk resulted in higher N levels than the other 2 treatments. These data indicate that growers who fertilize by hand can maintain the nutritional level and save considerable time by walking under mature trees and throwing the fertilizer in a 2 - 3 foot band within 3 feet of the trunk, instead of walking around the entire periphery of the trees when applying fertilizer

Magnesium and Calcium: The tree's magnesium (Mg) and calcium (Ca) requirements can best be met by maintaining an adequate dolomitic liming program. The pH of orchard soils should be maintained between 6 and 6.5. If a soil test shows that the pH of soil is 5.5 or below, magnesium sulfate sprays should be applied to prevent possible occurrence of magnesium deficiency. It takes from 3 to 5 years before dolomitic limestone is effective in correcting Mg deficiency. When magnesium sulfate sprays are used, apply 2-3 sprays of epsom salts at the rate of 20 pounds per 100 gallons of water. These sprays should be applied at the time of calyx, first cover and second cover sprays. To avoid possible incompatibilities, the epsom salt sprays should not be combined with the regular insecticidal sprays.

Mulch: The amounts of fertilizer applied to trees that have received annual applications of 200 or more pounds of hay mulch may be materially reduced or entirely eliminated. Tree performance should serve as a guide in determining the extent to which the rates of fertilizer may be reduced.

Minor elements: Soil applications of boron (B) should be applied to orchards every 3 years. Borax is the common material used. The rates of application per tree vary with age and size. Apply 1/4 pound of fertilizer borate (high grade - 13.6%) or its equivalent to young trees, 1/2-3/4 pound to medium age and size trees, and 3/4-1 pound to large or mature trees.

Many growers now rely on annual foliar applications of B. The usual practice is to add Solubor* to the first 2 cover sprays. Fertilizer grades of borax may contain grit and should not be used in a sprayer. Mature trees should receive 4 pounds of Solubor* per acre each year. Consequently, the goal is to apply about 2 pounds per acre in each of the 2 applications. For young orchards, the addition of 1/2 pound of Solubor* per 100 gals (dilute basis) to the first 2 cover sprays meets the B requirement of these trees. Reports for New York State indicate that sprays can be concentrated up to 8X with satisfactory results.

---

*Trade name

It is suggested that the need for minor elements other than B be established before making extensive corrective treatments. Our trials indicate that soil applications of zinc are of no immediate value for improving the zinc nutrition of the tree. While we have no evidence of widespread micronutrient deficiencies such as zinc and manganese, it is possible that some orchards may be approaching low levels of these elements. Studies in Maine indicate that zinc deficiency can be corrected with a dilute spray of 8 to 10 pounds of 36% zinc sulfate per 100 gallons, applied at "green tip", or just as the buds are breaking. Do not apply within 3 or 4 days of another spray, such as oil.

Maine reports indicate that 2 or 3 consecutive annual sprays may be necessary to correct severe zinc deficiency. Once the zinc deficiency has been corrected, the level can be maintained with fungicides containing zinc.

Manganese deficiency also has been noted in Maine and in these instances soil applications of manganese sulfate and sprays of fungicides containing manganese have proven beneficial.

Young orchards: In young non-bearing orchards, it may be possible to produce sufficient high quality mulching material for the young trees by broadcasting 500 to 800 pounds of mixed fertilizer per acre. Place the mulch in a band under the spread of the branches. The amount of fertilizer required for the trees with this system of culture will vary with the quantity and quality of mulch applied around each tree. If the trees are not making sufficient growth, 1/8 pound of ammonium nitrate per year of tree may be applied to the mulch. Our field trials show N levels of 2.3% - 2.6% in vigorous young McIntosh and Delicious apple trees.

During the last several years, some growers have discontinued the practice of mulching young apple trees, because of the mouse problem. Since many of our orchards are established in sod, control of vegetation under these trees with herbicides becomes necessary if optimum growth is to be obtained. Furthermore, application of 1/4-1/3 pound of ammonium nitrate or its equivalent of N for each year of age of tree is suggested. The fertilizer should be applied as early as possible in the spring to help avoid late growth and subsequent winter injury. Once the tree starts bearing, however, it may be necessary to reduce the rate of the fertilization to help red color development and under some conditions to help restrict tree size.

Fertilization of Peach Trees

Suggestions for fertilizing peach orchards are given in the following table.

Table 3. Normal rates of fertilizer for bearing peach orchards

	Approximate amounts per tree			
Tree age	Ammonium nitrate	Muriate of potash	or 0-15-30	8-16-16
	Pounds	Pounds	Pounds	Pounds
3 - 6	0.5-1.0	1.0-2.0	2.0-4.0	2.0-4.0
6 - 9	1.0-1.5	2.0-3.0	4.0-6.0	4.0-6.0
9 - 12	1.5-2.0	3.0-4.0	6.0-8.0	6.0-8.0
12 & over	2.0-4.0	4.0-8.0	8.0-12.0	8.0-16.0

The vegetation under these trees should either be controlled with herbicides, cultivation, or heavy mulch since N and moisture may limit performance of trees growing in heavy sod.

****

FOLIAR CALCIUM SPRAYS FOR BITTER PIT CONTROL

Mack Drake and J.H. Baker
Department of Plant and Soil Sciences

Foliar calcium sprays are recommended for bitter pit susceptible varieties, such as Baldwin, Northern Spy, Cortland and Red Delicious, especially on trees with a light crop or those that have produced pitted fruit in recent years.

We recommend using calcium nitrate (fertilizer or technical grade) at the rate of 5 pounds per 100 gallons of water. A spreader or wetting agent such as Triton B should be used at the rate of 3 fluid ounces per 100 gallons of water.

Apply 3 to 5 sprays at 2-week intervals. The first spray is applied about 2 weeks after petal fall. Note that foliar calcium sprays are an aid or supplement to a sound liming program and in no case are calcium sprays a substitute for lime on acid soils.

****

PUBLICATIONS AVAILABLE

Extension Bulletin 628, entitled "Farm Transfers and Estate Settlements - Taxes and Legal Costs" is available from the Cooperative Extension Service, Michigan State University, East Lansing, Michigan. This bulletin was prepared to provide farmers with prac-

tical information about tax and legal costs in settlements of estates and about intra-family farm transfer arrangements.

Another publication that may be of interest is Circular 545 entitled "Peach Production in Pennsylvania." Available from the Cooperative Extension Service, The Pennsylvania State University, University Park, Pennsylvania, this publication discusses among other things: (1) peach varieties and variety descriptions; (2) soil preparation and management; (3) chemical weed control; (4) pruning; and (5) fruit thinning.

****

PERFORMANCE OF NEWER BLUEBERRY VARIETIES IN EASTERN UNITED STATES

Dominic A. Marini
Southeastern Mass. Extension Region

Comments on the performance of the newer varieties of cultivated blueberries were solicited from Dr. Philip Marucci, Rutgers University, Dr. James Moulton, Michigan State University, and Dr. Donald Scott, U.S. Department of Agriculture, for presentation at the Annual Meeting of the Massachusetts Cultivated Blueberry Growers' Association.

Following are the comments of these authorities. The varieties are listed in approximate order of ripening:

In his opening remarks, Dr. Marucci mentioned that Bluecrop is presently the leading variety in New Jersey, while Dr. Moulton stated that Bluecrop, Rubel, and Jersey are the leading varieties in Michigan, with Bluecrop acreage increasing.

EARLIBLUE

Reports from New Jersey are that it has good flavor for an early-ripening variety, but that it lacks hardiness, is a poor shipper and requires a high concentration of bees for adequate pollination and fruit set. Earliblue is not sufficiently hardy or productive under Michigan conditions. U.S.D.A. reports from New England indicate Earliblue to be hardy and productive and to have large, sweet, mild and firm berries.

BLUETTA

is one of the newest varieties, ripening with Weymouth. New Jersey considers it a very promising variety that may soon replace Weymouth. It is low growing, has loose clusters of berries with good color, size and flavor. Michigan considers it more frost resistant than Weymouth with berries lacking size and has a questionable scar. U.S.D.A. reports it to be reasonably winter hardy with better color, flavor, and productivity than Weymouth.

COLLINS
is the most underrated of the new varieties according to New Jersey. It needs high bee concentrations for pollination and never got a chance because of low yields resulting from poor pollination. Experience in Michigan is limited, but it appears promising. It is more hardy than Earliblue, is productive, ripens uniformly, has a fairly good scar, but berry size has been variable. U.S.D.A. says New Hampshire rates it tops for winter hardiness.

BLUERAY
is highly susceptible to red ring spot virus in New Jersey. It is easy to prune and is the most prolific producer of new canes. Clusters are tight with good, spicy flavored berries, but bloom is lost in handling and berries become coal black in appearance. In Michigan, it ripens with Bluecrop, but is not considered as good in general fruit characteristics and has a large scar.

BLUECROP
is the leading commercial variety in New Jersey. It is hardy, vigorous, easy to prune, productive, with loose clusters of easy to pick, large, light blue berries of excellent keeping quality. It resists botrytis, mummy berry, anthracnose, and red ring spot virus, but is susceptible to stunt. It's only weakness is poor flavor; it must ripen for at least a week after turning blue to develop flavor. Experience in Michigan is the same. In New England, it has been observed that high temperatures are required to develop flavor in Bluecrop and that flavor does not develop in cool, cloudy seasons. It has never ripened well in New Hampshire where summers are somewhat cooler. Severe pruning is also necessary.

BERKELEY
is very susceptible to anthracnose in New Jersey. It is moderately hardy and productive; bushes are hard to prune; flavor is mild. In Michigan, it is susceptible to winter injury and blossoms are subject to frost injury. It is moderately productive, ripening one week ahead of Jersey; berries are beautiful; flavor is fair.

HERBERT
ripens with Jersey in Michigan, but it is not recommended because berries are soft with a poor scar.

ELIZABETH is considered the best flavored berry by many in New Jersey. It is moderately hardy, a mediocre producer, and needs careful pruning. It's large, easy-to-pick berries ripen until frost. Requires bees for pollination.

COVILLE
is susceptible to anthracnose in New Jersey. It's berries are spicy with good flavor, but it is hard to pollinate without a high concentration of bees and it is going out. In Michigan, the berries are large and firm with good flavor but it is not consistently productive.

DARROW
is not winter hardy in New Jersey and is a poor producer because of this. It is susceptible to red ring spot virus, and is already going out. In Michigan, it is too new to evaluate. Berries are large, firm, light blue with a strong, tart flavor and a good scar, ripening with Coville.

LATEBLUE
is too new for evaluation of vigor and hardiness. It is a promising, productive, good-flavored, late berry to replace Jersey and Coville in New Jersey. Experience in Michigan is limited also, but indications are that it matures rather late. U.S.D.A. says that it ripens 10 to 14 days after Jersey and is probably too late for New England.

BLUEHAVEN and NORTHLAND
were developed in Michigan for hardiness and released in 1967. Both appear winter hardy and productive. Bluehaven is a standard high-bush type ripening with and resembling Bluecrop, except that it is less flavorful. Northland is a slower growing, spreading, dwarf-type, extremely hardy with medium, dark colored, bland flavored berries.

****

BLACK ROT OF APPLES

Avery E. Rich, Plant Pathologist
University of New Hampshire

This disease goes by several different names, depending on symptoms and the organs attacked. The leaf-spot stage is commonly called "frogeye leaf spot", the canker stage on limbs is called "New York apple tree canker" or "black rot canker", and the fruit-rot stage is commonly called "black rot." All phases of the disease are caused by the fungus *Physalospora obtusa*.

As the above names imply, symtoms include necrotic leaf spots which usually begin to show up in late May or early June, limb cankers which show up at any time of year, and a brown or black rot of infected fruit. The fruit rot usually starts at the calyx end or at a wound, and progresses outward in a series of rings. Fruit rot symptoms show up from late summer until harvest. Finally, a completely rotted fruit may be transformed into a wrinkled, black mummy. Other symptoms and signs include black "pimples" on the cankered limbs, on the infected leaves, and on the rotting fruit. These are the fungus fruiting bodies (pycnidia) in which the spores are produced.

The fungus overwinters as a saprophyte on dead twigs, old fruit spurs, and especially on immature fruit mummies or "June drops" which did not drop. These are very common on Cortland trees. The spores are discharged during rainy periods in the spring and early summer. The heaviest spore release usually takes place around bloom or petal-fall time. Spores are disseminated by rain, wind-blown mist, and insects.

Control measures include maintenance of tree vigor, thorough and careful pruning, sanitation, spraying, and use of resistant varieties. All dead twigs and branches should be pruned out, removed from the orchard, and burned. Pruning cuts should be clean and close to a side branch or the main trunk. Dead stubs are common sources of fungus attack and inoculum production. These stubs may inevitably increase with some types of power pruners. Mummified fruit should be removed where practical. Experiments by Dr. James Holmes and the writer,at the University of New Hampshire, indicated that the small mummies on Cortland trees were a major source of inoculum. When these affected mummies were attached to McIntosh and Delicious trees, the incidence of leaf spot and fruit rot increased on these trees also. Therefore, thinning sprays or other treatments which may influence production and retention of immature fruit mummies may increase frogeye leaf spot and fruit rot the following year.

Spraying with captan, folpet, or a dithiocarbamate (ferbam, thiram, etc.) fungicide is partially effective in controlling leaf spot and fruit rot. On the other hand, dodine, glyodin, and dichlone were less effective in our orchard trials. Proper control of insects should also reduce the amount of fruit infection.

Cortland appears to be highly susceptible to frogeye leaf spot and black rot. It may not actually be more susceptible than other standard varieties, but the increased inoculum from the immature apple mummies results in heavier infection. McIntosh is susceptible to the canker phase of the disease, but leaf spot and fruit rot occur less commonly on this variety.

****

ARE INSECTICIDES THAT HAVE BEEN STORED STILL GOOD?

Gary L. Jensen
Ass't Professor of Entomology
University of Massachusetts

Growers nearly always have some insecticides left at the end of each year. While in storage, these pesticides may become frozen or may lose some of their desirable characteristics. A few simple tests may help the grower to determine whether or not these pesticides are still any good after storage.

Emulsifiable concentrates usually fail to mix properly if they have been frozen or have changed in some manner. To test them, shake the container thoroughly and place a small sample in a transparent container. A layering of the ingredients or a sediment may indicate a change in quality. Change in quality may also be determined by making a sample mixture of the concentrate. To a quart jar half full of water, add 2 tablespoonsful of the sample concentrate, cover the container and turn it over a few times. The mixture should be uniformly milky, and after setting for an hour or so, there should be no layering, i.e., no clear layers or differentiation of colors in the mixture. A clear layer at the top is an indication that the solvent may have separated, and an application of such a mixture could result in a severe burning of the foliage. The formation of an opaque cream-like material at the top (called creaming) is not good if too much accumulates.

Wettable powders, which are not caked up and have been preserved in a tightly closed container in a dry place, should be good for use the next year.

****

WARNING! MOST PESTICIDES ARE POISONOUS. READ AND FOLLOW ALL DIRECTIONS AND SAFETY PRECAUTIONS ON LABELS. HANDLE CAREFULLY AND STORE IN ORIGINAL CONTAINERS OUT OF REACH OF CHILDREN, PESTS AND LIVESTOCK. DISPOSE OF EMPTY CONTAINERS RIGHT AWAY, IN A SAFE MANNER AND PLACE. DO NOT CONTAMINATE FORAGE, STREAMS OR PONDS.

Cooperative Extension Service
University of Massachusetts
Amherst, Massachusetts
A. A. Spielman
Director
Cooperative Agricultural Extension Work
Acts of May 8 and June 30, 1914

Official Business
517 — 2/70 — 1000
Permit No. 1216

Postage and Fees Paid
United States Department of Agricul

FRUIT NOTES

Prepared by the Department of Plant and Soil Sciences
Cooperative Extension Service
College of Agriculture
University of Massachusetts, Amherst

EDITORS

W. J. LORD AND W. J. BRAMLAGE

MAY—JUNE 1970

TABLE OF CONTENTS

Issued by the Cooperative Extension Service, A. A. Spielman, Dean and Director, in furtherance of the Acts of May 8 and June 30, 1914; University of Massachusetts, United States Department of Agriculture and County Extension Services cooperating.

THE ROLE OF BEES IN THE POLLINATION OF DECIDUOUS FRUITS

F.R. Shaw - Department of Entomology
University of Massachusetts

The principal insects of value in the pollination of fruit in New England include honey bees, solitary bees and bumble bees. Honey bees overwinter as colonies consisting of a queen plus many thousands of workers. Only the queens of bumble bees survive the winter and these hibernate. There are a great many species of solitary bees. They may pass the winter as queens in hibernation or in some species as the larva or immature form. In the spring each female constructs her own nest, usually in the soil, collects nectar and pollen and stores these materials in a cell. She then lays an egg in each cell and no further care is given to the developing bee.

Relative Importance of Different Kinds of Bees for Pollination:

1. Honey bees are the only pollinating insects that can be increased in numbers and located where needed, from a practical viewpoint.

2. Honey bees are less dependent on favorable weather for flight than solitary bees. Bumble bees are superior in this respect.

3. Honey bees are more constant to a single species of plant when collecting nectar or pollen than are solitary bees or bumble bees. Investigations in Canada have indicated that honey bees are 80 per cent constant, solitary bees 55-70 per cent and bumble bees 65 per cent.

Characteristics of Colonies Most Suitable for Pollination:

1. Colonies should be strong. It is suggested that there should be sufficient bees to cover 5-6 frames as a minimum (determined by checking colony when temperature is 60-65°F.) Such colonies should be sending 40-50 bees per minute at these temperatures unless rain, wind, light or other factors are unfavorable.

   Farrar made comparison of flight rate of different types of colonies during pollination period. A portion of his data is reproduced below:

Type of colony	Temperature 90°F. Relative Humidity 50%	Average No. Bees flying per minute
3 lb. package		15
5 lb. package		50
3.5 lb. overwintered colony		65
7 lb. overwintered colony		128

2. Colonies should possess a laying queen.

3. Colonies should be disease free.

Number of Colonies Needed Per Acre:

An old "rule of thumb" recommendation was one colony per acre. We now recognize that it is difficult to select a standard that will apply under all conditions due to variation in populations of pollinators naturally present, weather factors, colony conditions, exposure of orchard and other factors.

Location of Colonies in Orchard:

Most recent investigations demonstrate the advisability of placing colonies in groups throughout the orchard taking advantage of natural wind breaks or providing artificial cover if necessary. Colonies should face south or southeast.

When To Move Colonies Into the Orchard:

It is not recommended that bees be placed in an orchard ahead of bloom, since the bees may become trained to visit other flowers. It is suggested that the colonies be moved in when bloom has opened or even wait a day or so if conditions for flight appear to be satisfactory.

Some of the Problems Facing A Beekeeper Who Rents for Pollination:

1. Loss of queens or colonies during moving

2. Swarming

3. Exposure to disease

4. Exposure to pesticides

How Bees May Be Poisoned:

1. Contamination of water, nectar or pollen with pesticides which have stomach poison action on bees. Contaminated water and pollen may kill both the brood (immature bees) and the adults. Poisoned nectar kills mainly adult field bees but there are some exceptions depending on speed of action of pesticide and distance bees have to fly.

2. Direct contact with pesticide during application. Adult field bees are primarily affected but brood may be, from neglect---starvation or exposure to extremes of temperature.

3. Exposure to pesticides having prolonged residual action. In some instances heavy mortalities have resulted from exposure to residues on leaves, twigs, or blossoms on which bees may crawl or rest.

Comparative Toxicity of Pesticides to Honey Bees:

Anderson and Atkins, 1967, University of California, have conducted exhaustive studies on the relative toxicity of pesticides to honey bees. Some of the investigations have been conducted in the field and some are laboratory studies. On the basis of their work, they classify the toxicity of pesticides to honey bees in three groups; Highly toxic, Moderately toxic and Relatively non-toxic. It must be remembered that the effects of weather on pesticides may influence the toxicity of the material to insects so that some of the results reported for California might not be the same as would be the results here in New England.

The comparison that follows of the toxicities of pesticides to honey bees is taken verbatim from Anderson and Atkins, 1967, Toxicity of Pesticides and Other Agricultural Chemicals to Honey Bees (University of California Extension Publication AXT-251).

Table 1. Relative toxicity of pesticides to honey bees as determined by laboratory and field tests in California (1950-1966).

GROUP 1 - HIGHLY TOXIC: Severe losses may be expected if the following materials are used when bees are present at treatment time or within a day thereafter, except as indicated by footnotes.

aldrin
arsenicals[1,2]
Azodrin R
 (crotonamide)[2]
Baygon R
Baytex R
 (fenthion)
BHC[2]
Bidrin R[1,2]
Bomyl R
Chlorthion R
Cygon R
 (dimethoate)[2]
Dasanit R
DDVP
 (dichlorvos)

diazinon[2]
Dibrom R
 (naled)[2,3]
dicapthon
dieldrin[2]
Dimecron R
 (phosphamidon)[2]
Dursban R
EPN[1,2]
Ethyl Guthion R
 (azinphosethyl)
Famophos R
 (famphur)
Furadan R[2]
Gardona R[2]

Guthion R
 (azinphosmethyl)[2]
heptachlor
Imidan R
Isolan R
lindane[2]
malathion[2,4]
Matacil R
Mesural R
Metacide R[1]
methyl parathion[1,2]
Methyl Trithion
Mobam R
parathion[1,2]
Phosdrin R
 (mevinphos)[1,2,3]

Sevin R (carbaryl)[2]	Temik R[2]	Zectran R[2]
Sumithion R	TEPP[1,2,3]	Zinophos R

GROUP 2 - MODERATELY TOXIC: These can be used around bees if dosage, timing, and method of application are correct, but should not be applied directly on bees in the field or at the colonies.

Abate R[2]	endothion	Pyramat R
Agritox R	endrin[2]	Systox R (demeton)[1,2]
Banol R	Korlan R (ronnel)	tartar emetic
chlordane	Meta Systox R (methyl demeton)	Thimet R (phorate)[1,2,6]
Ciodrin R	Meta-Systox R R (oxydemetonmethyl)	Thiodan R (endosulfan)[2]
Co-Ral R (coumaphos)	mirex	Tranid R
DDT[1,2]	Perthane R[2]	Trithion R (carbophenothion)[2]
dimetilan	Phosalone R	
Di-Syston R (disulfoton)[1,6]		

GROUP 3 - RELATIVELY NONTOXIC: These can be used around bees with a minimum of injury.

INSECTICIDES

Allethrin	Dylox R (trichlorfon)[2]	Morocide R (binapacryl)	Photex R
Aramite R	Eradex R	Murvesco (fenson)	pyrethrin
Bacillus thuringiensis	Genite 923 R	Nemagon R[2]	rotenone[2]
chlorobenzilate	*Heliothis* virus	Neotran R[2]	Rhothane R (TDE)[1,2]
cryolite[2]	Kelthane R (dicofol)[2]	Nialate R (ethion)[2]	ryania[2]
Delnav R (dioxathion)[2]	Kepone R	nicotine[2]	sabadilla[2,5]
	methoxychlor[2]	Omite R	Saphos R (menazon)

Dessin R	Mitox R (chlorbenside)	OMPA (schradan)[1]	Strobane R
Dilan R[2]	Morestan R	Ovotran R (ovex)	Sulphenone R
Dimite R (DMC)			Tedion R (tetradifon)
DNOCHP (dinitro- cyclohexyphenol)			toxaphene[2]

FUNGICIDES

Arasan R (thiram)	Cyprex R (dodine)	Karathane R (dinocap)	Phaltan R (folpet)
bordeaux mixture	Dexon	Manzate R (maneb)	Pygon R (dichlone)
captan copper oxychloride sulfate	Difolatan R (folcid)	Mylone R	Polyram R
		Parzate R (nabam)	sulfur[2]
copper 8-quinolinolate			
	Dyrene R		Zerlate R (ziram)
copper sulfate (monohydrated)[2]	Fermate R (ferbam)	Parzate Zineb R (zineb)	
cuprous oxide	Glyoxide R (glyodin)		

GROUP 3 - RELATIVELY NONTOXIC (continued)

HERBICIDES

amitrol	Herbisan R (EXD)	monuron NPA	simazine
Banvel-D R (dicamba)	IPC	paraquat	Trysben R (2,3,6-TBA)
dalapon	Karmex (diuron)	Planavin R	Vegedex R (CDEC)

diquat	MCPA	Randox R (CDAA)	2,4-D[1,2]
Eptam R (EPTC)			2,4,5-T[1,2]
		sesone	

DEFOLIANTS

DEF R		Folex R (merphos)	PREP R

FOOTNOTES

[1]California state regulation requires permits for most uses of these materials; also for 2,4-D and 2,4,5-T as weed treatments but not as hormone sprays on citrus.

[2]These materials have been laboratory tested and field tested mainly on alfalfa, cotton, citrus, ladino clover, and sweet corn; all others are laboratory tested only.

[3]Dibrom, Phosdrin, and TEPP have such short residual activity that they kill only bees contacted at treatment time or shortly thereafter. These materials usually are safe to use when bees are not in flight; they are not safe to use around colonies.

[4]Malathion has been used on thousands of acres of blooming alfalfa without serious loss of bees. However, occasional heavy losses have occurred, particularly under high temperature conditions. If applied to alfalfa in bloom, it should be only as a spray, and treatment should be made during the night or early in the morning when bees are not foraging in the field. Undiluted technical malathion spray should not be used around bees.

[5]Sabadilla as a 20 percent dust, as it is sometimes used for stink bug control, may cause bee losses.

[6]Di-Syston and other systemics used as a seed treatment have not caused bee losses.

<u>What is Being Done to Reduce Danger of Poisoning?</u>

1. Research on comparative toxicities of pesticides to bees. This provides information of value in making recommendation for the use of such materials.

2. Investigations on possible use of substances repellent to bees. These would be included in sprays in order to cause bees to avoid treated surfaces.

3. Extension specialists recognize danger of poisoning and recommend measures to minimize poisoning. Among these might be (1) proper timing to avoid pesticide applications to plants attractive to bees while in bloom, (2) applications in early morning or in evening when fewer bees will come in direct contact with poison, and (3) avoidance of contamination of area where spraying or dusting equipment is being filled, particularly if there is standing water in vicinity by bees.

Suggestions to Improve Grower-Beekeeper Relations:

Have definite agreement as to:

1. Number of colonies wanted.

2. Strength of colonies.

3. When colonies are to be moved in and out of orchard. Beekeeper needs 48-72 hours notice.

4. Distribution of colonies in orchard.

5. Avoidance of use of harmful pesticides while bees are in orchard.

6. Rental price with terms of payment.

****

ENVIRONMENTAL FACTORS TO CONSIDER WHEN SPRAY THINNING APPLES

Duane W. Greene
Department of Plant and Soil Sciences

Spray thinning recommendations for the concentration and timing of application of such compounds as naphthaleneacetic acid (NAA), naphthaleneacetamide (NAD) and Sevin have been established and used quite successfully. However, these recommendations are based on the assumption that weather conditions something near "normal" prevailed prior to and during the period of spraying. As every fruit grower knows, substantial variations from "normal" weather conditions can occur during this time, and such variations may make it necessary to alter the concentration of the material being applied.

Environmental conditions may influence in two ways the amount of a thinning agent that enters the plant and thereby affect the thinning response.

1. Weather conditions prior to spray application: Weather conditions preceding the application of a thinning spray can influence the

development of the waxy covering (cuticle) of the leaves. If weather conditions are cool and rainy with little sun showing during the two weeks before spraying, the leaves developing during this time will have a very thin cuticle. Under these conditions, applied thinning chemicals would penetrate into the leaf relatively easily and overthinning is likely. On the other hand, warm, dry, sunny conditions prior to spraying would result in a leaf having a thick cuticle that would impede the movement of a thinning chemical into the leaf. In this case, the concentration of the thinning agent used may have to be increased to obtain adequate thinning.

2. Weather conditions at the time of spraying: As temperatures increase at the time of spraying, the amount of thinning spray entering the leaf increases. When temperatures rise above 85°F., there is a rather sharp increase in penetration especially with NAA and NAD. If the high temperatures are accompanied by humid conditions that prevent spray droplets from drying rapidly, overthinning will be almost assured. In this case, the thinning agent concentration should be reduced. At the opposite extreme, poor thinning results would be expected if a spray were applied during cool, dry weather when the applied spray droplet would dry rapidly.

****

GROWING BETTER STRAWBERRIES

(Highlights of talk by Dr. Carter Smith, Rutgers University, given at Vegetable Growers' meeting, Concord, New Hampshire)

Prepared by Dominic A. Marini, Southeast Extension Region

STRAWBERRY VARIETIES

Dr. Carter Smith opened his talk on "Growing Better Strawberries" with a discussion of variety performance under New Jersey conditions. His comments, which follow, are of particular interest since these varieties also are grown in New England. It should be remembered that variety performance is greatly influenced by climatic, soil, and cultural conditions, therefore, it is suggested that you test a variety under your conditions before planting it on a commercial basis.

EARLIDAWN - A very early ripening variety, but the fruits have poor color and flavor, and the plants are susceptible to Verticillium wilt. This variety is becoming less popular in New Jersey.

MIDLAND - An older variety which matures its fruit early. The berries are of high quality but the variety is not widely grown.

SUNRISE - Becoming the leading early-maturing variety in New Jersey. The fruits have good shape and color but size falls off after the third picking. Dr. Smith recommended plowing under the plants after the third picking.

RARITAN - A new midseason introduction of the New Jersey Agricultural Experiment Station. It is becoming the most important main season variety in New Jersey. The fruits have good color and gloss. In trials at Rutgers University, Raritan has been the highest producer during the past 5 years, followed by Jerseybelle and Vesper. Diphenamid herbicide should not be used on this variety, since injury has been observed.

DIXIELAND - Genetic Yellows has been found in this variety and it is not being recommended for planting in New Jersey.

CATSKILL - An old variety with high quality fruits. The fruits have a tender skin and are too soft for New Jersey conditions.

REDCHIEF - Resistant to 5 races of red stele with some Verticillium wilt resistance.

GUARDIAN - This variety is a sister to Redchief and has the same red stele resistance but more Verticillium resistance.

MIDWAY - A popular variety in New Jersey.

SURECROP - It was first of the varieties to have resistance to several strains of red stele, but it is susceptible to newer races of this disease.

SPARKLE - No longer grown commercially in New Jersey because the fruit size declines rapidly as harvest season progresses. The excellent quality of fruits makes it a highly desirable variety for the home garden or for roadside stand sales.

JERSEYBELLE - The leading money-maker strawberry variety in New Jersey until 2 years ago. The fruits are attractive, good size and fair flavor.

VESPER - The fruits are too soft for New Jersey requirements. The plants produce the largest strawberry grown and the fruits are of fairly good quality.

STRAWBERRY CULTURE

Regarding strawberry culture, Dr. Smith commented that plastic mulch is not recommended in New Jersey since increased yields do not offset the additional cost for the plastic and for runner plant re-

moval. In comparison of the Hill System (no plastic mulch) vs. The Matted Row, the yields have been comparable. However, fruit size and yield are increased by removal of excess runners from the Matted Row.

GROWING PROBLEMS

In his discussion of growing problems, Dr. Smith was of the opinion that Verticillium wilt can be controlled to some extent by soil fumigation. Where Verticillium is a problem, fumigation before starting a new strawberry bed was recommended. Furthermore, strawberries should not follow eggplants, potatoes, tomatoes and other wilt-susceptible crops. Winter injury can be more of a problem than most growers realize. Temperatures as high as 28°F. can cause internal browning of the crown and reduction in yield. Earlier mulching before the occurrence of such temperatures was advocated by Dr. Smith.

MECHANIZATION

There is some mechanization of the New Jersey strawberry industry. A mechanical pruner for the removal of excess runners does a good job on a soil free of stones. Transplanting machines are being used for setting plants and for harvest some growers now are using a picking aid similar to the pickle harvester. With the latter device, the pickers lie on a platform and pick the berries as the tractor-drawn platform passes over the plants.

MARKETING STUDY

A brief mention was made of a marketing study at Rutgers, involving pricing of quart and pint containers. The study showed that when the price is high, there is no pricing advantage of pints over quarts. When the price falls, it is easier to maintain the price for the pints than for the quarts of berries.

FUTURE OF THE INDUSTRY

Dr. Smith noted that the acreage devoted to the production of strawberries in the United States is declining. He stated that there will always be a place for the present "one-crop" strawberry variety but he predicted a shift toward the greater use of everbearers. This shift awaits the development of superior everbearing varieties; current everbearing varieties are not suitable.

Mechanical harvesting of strawberries is coming. The first harvesters will be non-selective, requiring varieties that ripen all their fruit at the same time. Machine-harvested fruit is suitable for processing but not for the fresh market. Large acreage will be required to justify the cost of harvesting machines; such acreages are not available to Eastern growers. What is really needed is a selective harvester that will harvest ripe fruit, without injury, for the fresh market. This machine will be longer in coming and will require long season; everbearing-type varieties so as to provide for orderly marketing and to stabilize the labor supply.

WARNING! MOST PESTICIDES ARE POISONOUS. READ AND FOLLOW ALL DIRECTIONS AND SAFETY PRECAUTIONS ON LABELS. HANDLE CAREFULLY AND STORE IN ORIGINAL CONTAINERS OUT OF REACH OF CHILDREN, PESTS AND LIVESTOCK. DISPOSE OF EMPTY CONTAINERS RIGHT AWAY, IN A SAFE MANNER AND PLACE. DO NOT CONTAMINATE FORAGE, STREAMS OR PONDS.

Cooperative Extension Service
University of Massachusetts
Amherst, Massachusetts
A. A. Spielman
Director
Cooperative Agricultural Extension Work
Acts of May 8 and June 30, 1914
—
Official Business
525 — 5/70 — 1000
Permit No. 1216

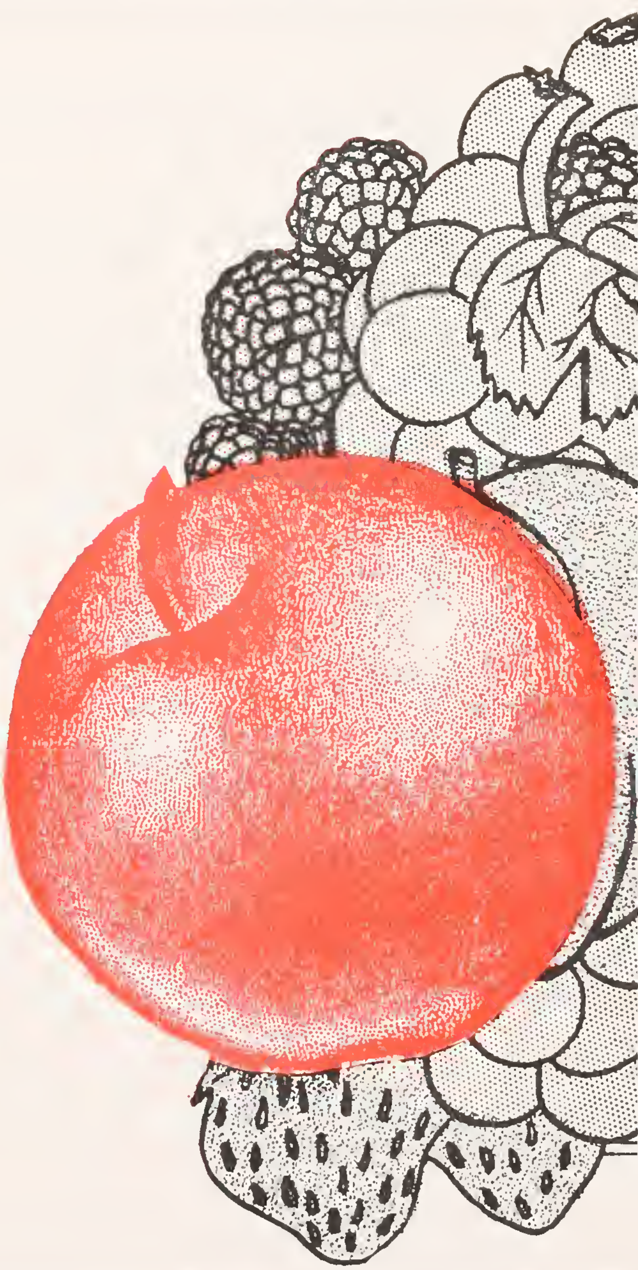
Postage and Fees Paid
United States Department of Agriculture

FRUIT NOTES

Prepared by the Department of Plant and Soil Sciences
Cooperative Extension Service
College of Agriculture
University of Massachusetts, Amherst

EDITORS

W. J. LORD AND W. J. BRAMLAGE



JULY–AUGUST, 1970

TABLE OF CONTENTS

Issued by the Cooperative Extension Service, A. A. Spielman, Dean and Director, in furtherance of the Acts of May 8 and June 30, 1914; University of Massachusetts, United States Department of Agriculture and County Extension Services cooperating.

All pesticides listed in this publication are registered and cleared for suggested uses according to Federal registrations and state laws and regulations in effect on the date of this publication.

When trade names are used for identification, no product endorsement is implied, nor is discrimination intended against similar materials.

<u>NOTICE.</u> THE USER OF THIS INFORMATION ASSUMES ALL RISKS FOR PERSONAL INJURY OR PROPERTY DAMAGE.

<u>WARNING!</u> PESTICIDES ARE POISONOUS. READ AND FOLLOW ALL DIRECTIONS AND SAFETY PRECAUTIONS ON LABELS. HANDLE CAREFULLY AND STORE IN ORIGINAL LABELED CONTAINERS OUT OF REACH OF CHILDREN, PETS, AND LIVESTOCK. DISPOSE OF EMPTY CONTAINERS RIGHT AWAY, IN A SAFE MANNER AND PLACE. DO NOT CONTAMINATE FORAGE, STREAMS, AND PONDS.

SUCCESS WITH STRAWBERRIES

Dominic A. Marini
Southeast Extension Region

The demand for fresh local strawberries is strong, but since production costs per acre are high in comparison with the costs of many other crops, yields must be high in order to make substantial profits. If the following items are kept in mind, high returns per acre are possible in Massachusetts.

Plants: The importance of starting with good plants cannot be overemphasized. Good plants are not only free from disease, but are also in good physical condition. If well grown in the nursery, the strawberry plant has large crown and root systems that are high in food reserves and mineral nutrients. Therefore, be particular about the size and vigor of plants received from the nursery.

Remember that good plants are plants free of all disease, not just virus-free. The free plants obtained from a neighbor may not be so cheap in the long run because of low productivity, red stele and other diseases.

Site and soil: A location with a gentle slope for air and water drainage is highly desirable for strawberries. On steeper slopes, planting on the contour will help prevent erosion damage, while on flat, poorly drained sites planting on raised beds helps to prevent crown and root injury from a water-logged soil.

No specific soil type is recommended for strawberries since varieties differ in their soil requirements. But in general, light, sandy soils are preferred for early varieties, while late varieties usually do best on heavier soils. Soil pH should be in the 5.5-6.0 range.

Crop rotation and high organic matter: A definite rotation helps maintain an adequate supply of organic matter in the soil which is so essential for success with strawberries. A rotation should be used that keeps the land out of strawberries for one full year or more. Under these circumstances, a sod crop is more desirable than a green manure crop because it requires less labor and is more beneficial.

Where a sod crop is impractical, however, strawberries may be grown in rotation with cultivated crops such as peas, beans, squash, cucumbers or corn. They should not follow crops of tomatoes, potatoes, peppers, egg plant, or raspberries, since these crops are susceptible to Verticillium wilt which also affects many varieties of strawberries.

When no extra land is available, growers may rely on green manure crops to supply organic matter from the time the old bed is plowed after harvest until strawberry plants are again set the next spring.

Crop rotations and green manure crops are discussed in detail in Publication No. 17 entitled "Small Fruit Culture," which is available from the Plymouth County Extension Service Office.

Soil fumigation: Any grower seriously interested in growing strawberries should make fumigation a regular practice. The investment in land, labor, plants and time is too great to risk crop failure from black root rot or Verticillium wilt, which are becoming more widespread. With the excellent soil fumigating chemicals available today plus the availability of custom application, soil fumigation is available to every grower. To be effective, fumigation should be done in early fall and plants should be set the following spring.

For fumigation, soil temperature should be about 60°F. The soil should be neither too wet nor too dry, and it should have been plowed and harrowed beforehand. All plant residues should be completely decomposed.

Early planting: Early spring planting is a key to success in strawberry growing. Plants should be set as soon as the soil can be worked, preferably in early April. At this time of year, plants are freshly dug, have not started to grow, and will suffer minimum setback in transplanting. Also, there is usually ample soil moisture for rooting of the transplants. The early-set plants produce numerous and large daughter plants. Large plants with many leaves and large multiple crowns are essential for high yields.

Fertilization: Where manure is used, it is not necessary to apply additional fertilizer at planting. Following a cover crop, however, 800 pounds of 10-10-10 fertilizer or its equivalent per acre are suggested, and without manure or cover crops, 400 pounds of 10-10-10 fertilizer per acre are desirable. The necessity of additional fertilizer during the growing season is dependent on the size, vigor and color of the plants. Sidedressing with a nitrogen carrier at the rate of 30 pounds of actual nitrogen per acre one month after setting plants and again in late August just before fruit bud initiation is commonly practiced by growers, however.

Irrigation and frost protection: Irrigation is a must for consistently high yields. Strawberries are shallow rooted plants with 75 percent of their root system in the top three inches of soil. Therefore, irrigation is of particular benefit if dry weather prevails in spring after setting plants, in the fall during fruit bud development, or when fruit is developing.

Irrigation is also extremely useful for protection against spring frost; a cause of reduced strawberry yields in Massachusetts last year. The value of irrigation can be illustrated by the experience of one Massachusetts grower who, in 1969, harvested 17,000 quarts per acre on a bed that required irrigation for frost protection on 13 nights in May. Irrigation, turned on when the temperature at plant levels drops to 32° F, and continued until the temperature rises above 32°F, will provide protection from temperatures as low as 22° F.

Heat is another method of frost protection. Many small fires (100 heat blocks per acre) are more effective than a few large fires. Light the blocks when the temperature drops to freezing and light only those required to hold the temperature above freezing!

Weed and pest control: Of prime importance in the success of strawberry growing is good weed control and the control of insects and diseases. Improper timing of application and lack of moisture following the use of a pre-emergence herbicide are the frequent cause of poor weed control and result in the necessity of using expensive hand labor for the removal of weeds.

Too many growers allow their yields to be reduced by cutworms and fruit rots when these problems can be controlled easily by following suggestions in the Strawberry Pest Control Chart.

Prevention of winter injury: Plants that are hardened off can withstand crown temperatures of 24° without injury, but sudden cold snaps early in the fall before plants are completely hardened can cause injury at 28°. Crown temperatures of 20° or lower can cause serious injury or death of plants. The degree of plant injury depends, however, on such variables as weather conditions prior to the cold period, the duration of the cold period and the rapidity of freezing and thawing.

Mulch will help prevent winter injury. In Massachusetts, the mulch should be applied about mid-November after the plants are dormant but before temperatures below 24° occur. Mulching material should be coarse so that it does not pack tightly and should be applied in a layer about 3 inches thick. Rye straw makes a good mulch. Salt marsh hay and pine needles are popular mulches. Do not remove the mulch until the "odds are against" damaging temperatures but before the plants start to turn yellow beneath it. Replace part of the mulch to keep the berries off the ground.

****

POMOLOGICAL PARAGRAPH

Red Spider Mite Damage on Young Fruit Trees may affect root growth, leaf size, shoot extension, defoliation, and photosynthesis and dry matter content. The net carbon dioxide assimilation by leaves of plum and apple was found to decrease little until 50% of the leaf was speckled, or appeared bronze in color. However, infection decreased shoot growth before assimilation, and root growth before shoot growth. Conversely, shoot growth was increased by intermediate population densities, 0.8 to 2.1 mites per square centimeter, according to D.J. Avery and J.B. Briggs, East Malling, England. Mites apparently feed first on leaves which export photosynthates to the older parts of the stem and roots. Their damage to the leaves brings about partial closing of the stomata, and reduced trans-

piration loss. Some of the plant growth effects observed with red spider mite population have been indicated to be a result of injection or removal of growth promoting and inhibiting substances. In mite-infected plum material, D.J. Avery and H.J. Lacey found greater amounts of gibberellin-like substances and smaller amounts of auxin-like substances, except IAA.---Penn. State Horticultural Reviews, October, 1969.

****

FACTORS AFFECTING NUTRIENT CONTENT OF APPLE FOLIAGE

(Editors' Note. The following discussion of factors affecting nutrient content of apple foliage was prepared by the late Dr. W.D. Weeks and appeared in the May 10, 1964, issue of Fruit Notes. A review of these factors appears essential from time to time because an increasing number of growers are using leaf analyses as a guide for the maintenance of optimum nutritional levels in apple orchards.)

Crop size can have a considerable effect on the quantity of several elements in apple foliage. Leaves from a tree with a large crop will contain more nitrogen and less potassium than leaves from a tree with a light crop. Leaves from a light crop tree may have a leaf nitrogen which is 0.2 and 0.3 per cent lower than the same tree when it has a full crop. Differences in leaf potassium as great as 0.4 per cent may occur between heavy and light crop years. Calcium follows the same trend as nitrogen and exhibits about the same difference as nitrogen in leaf content between the light and heavy crop year. Leaf magnesium is slightly higher in a heavy crop than in a light crop year. Crop size has little, if any, effect on leaf phosphorus.

The relative amount of one element in relation to another may effect the mineral content of the leaf. For example, leaves which are relatively high in nitrogen tend to have lower levels of potassium and phosphorus and higher levels of magnesium and calcium than leaves from trees which have a low to medium level of nitrogen. High levels of potassium may depress leaf magnesium and calcium, particularly if the soil supply of magnesium and calcium are low. However, moderate levels of potassium do not seriously depress magnesium where there is an adequate supply of magnesium.

Another factor which may influence the leaf content of some elements is soil moisture or rainfall. Leaf potassium is generally lower in dry growing seasons than in years with adequate soil moisture. Magnesium is generally lower in years which have above-normal rainfall during the early part of the growing season. The magnitude of the change in leaf content caused by seasonal rainfall will depend upon the wetness or dryness of the season and the supply of nutrients

in the soil. Soil moisture extremes, either wet or dry, which prevent the development of new roots could conceivably reduce the leaf content of essential elements.

****

BIRD DAMAGE RESEARCH IN MASSACHUSETTS

Frederick Greeley and Donald Chubbuck[1]

Research on nuisance species of birds has been conducted in Massachusetts for at least 15 years by several agencies---federal, state and private. The species studied are characterized by either population or behavior which has, in variable degree, exceeded levels of human tolerance. Virtually all the species, whether introduced from other countries or native, have become nuisances as a result of environmental changes induced by man. The Herring Gull, once rare in Massachusetts, has increased in numbers (to the point of being hazardous to aircraft) because of increased food sources at garbage dumps, fish wharves and the like. Breeding habitat for Baltimore Orioles, Robins and European Starlings has increased with the expansion of suburbs with their lawns (feeding areas for Robins hunting earth worms),shade and ornamental trees, and houses (nesting support for all three). These three species are all natural feeders on fruits, whether wild or commercial. At the University of Massachusetts, basic research on fruit depredation and on the ecology of Robins and Baltimore Orioles has been conducted for a number of years

While we have not uncovered, here or elsewhere, any sure economic means of preventing birds from damaging fruit, we have gained some knowledge pertaining to the problem. Most fruits ripen after young birds have taken wing from the nest and become a part of a population in Robins, for example, most of the birds we have observed in University orchards are young-of-the-year. We, therefore, are inclined to ask, "How far do they come from, how do they find their way to sources of fruit, and how do they recognize ripeness and edibility of fruits in their first encounter with it?" So far, at least, our studies of the dispersal of marked Robins from their nests indicate they may not travel any farther than need be to find an abundant fruit supply. At the University, the young of one nesting population were able to find a non-commercial source within a half mile of the nests in which they hatched. Although the University orchard, with its cherries and blueberries, was only one mile away, few of these young birds ever appeared there. This suggests that suburban areas in which fruiting species of trees and shrubs were used as part of the ornamental and shade-tree community might divert Robins from commercial orchards by holding them closer to nesting areas in the ripening season.

It is difficult to determine how young Robins find their way to sources of fruit and other food but a few of our observations indicat

[1]Assoc. Prof. and Graduate Student, respectively, Dept. of Forestry and Wildlife Management, University of Massachusetts.

that parent birds, or even other adults, serve as guides to the young which are unfamiliar with the surrounding area. Adults may also serve to acquaint the young with unfamiliar foods. We have observed some adults which fed large numbers of cherries to nestlings and later, to fledglings of their own and of others. Fledglings continue to beg from adults after the young leave the nest and are frequently fed by their parents or other adults. We made an effort to test the ability of young, hand-reared Robins to recognize novel foods such as blueberries and cherries. The results of 240 trials in which young Robins were fed either a blueberry or a cherry, half of them while they watched a trained adult eat the same kind of food could not be clearly interpreted. The young which were visually but not acoustically isolated from the adult seemed to take little interest in cherries in the course of six trials while those which could see the adult at least began pecking at the cherry in the later trials. Cherries would seem to be more difficult for young robins to handle than are blueberries; even the adult bird increased his skill at pulling apart a cherry as the tests proceeded. Very early in the trials, both groups of young birds learned to eat blueberries and there seemed to be very little difference in the number of trials it took to recognize blueberries as food and to eat them. If we are to understand the mechanisms that govern feeding by Robins on fruit, more research is understandably needed.

For example, we need to ask whether historical changes in the habitat of species such as Robins, Orioles and Starlings are responsible for the apparently increasing bird fruit-damage of the past 20 years. To do this, we feel that breeding habitat needs to be carefully defined and changes in its extent and quality determined, in the hope that management procedures may be developed that would diminish losses of agricultural crops to birds. Histories of past damage to individual plantations, provided by their owners, may help to determine whether urban and suburban development has been a factor in increased depredation by certain pest species. By and large, most bird pests are a product of human culture, not of undisturbed, natural environments. It is to this aspect of the problem we need to give some attention.

****

HERBICIDE INJURY SYMPTOMS

William J. Lord
Department of Plant and Soil Sciences

One of the objectives of our weed control studies is to obtain descriptions and photographs of herbicide injury. Some of these have been published in Extension Service Publication 32, entitled "Herbicides - Their Nature, Persistence and Effect on Fruit Trees." We now have more complete descriptions of diuron and dichlobenil injury and more photographs[1] which are presented below.

---

[1] Photographs by L.J. Musante, School of Education, University of Mass.

Diuron Injury: A faint loss of chlorophyll from the main veins is the first distinguishing characteristic of diuron injury to EM VII rootstocks. As the condition worsens, the interveinal areas adjacent to the main vein become yellowish-green, being most severe on the basal portion of the leaf. The fading of chlorophyll (chlorosis) in the affected area results in a striking contrast in coloration since the remainder of the leaf remains dark green. The leaves on the lower branches are affected first. Chlorosis is followed by marginal browning (necrosis) of the leaves. Severe injury causes interveinal necrosis and abscission.

<u>Paraquat injury</u>: Injury from paraquat results when tree foliage or fruit is hit by spray; injury does not result from root absorption. Varying degrees of chlorosis and necrotic spotting occur on apple foliage with no distinctive pattern. The older chlorotic tissue breaks down and necrotic spots appear. Abscission of severely injured leaves occurs. The skin of young apple fruits hit by paraquat spray may show burn spots or russet. The skin and flesh in the severely burned areas cracks (Figure 1) and many badly injured fruits drop prematurely.

Fig. 1. Injury to McIntosh apple from paraquat spray. Skin and flesh of areas burned by paraquat cracked and then healed.

<u>Dalapon injury</u>: The distinguishing symptom of dalapon injury is marginal leaf necrosis (Figure 2.) Dalapon is readily translocated in the plant and new growth following spraying may develop severe injury symptoms. Dalapon injury has the tendency to persist through the growing season.

<u>Dichlobenil injury</u>: Symptoms of dichlobenil injury are characterized by yellowing of the leaf margin (Figure 3), which generally appears in early August or later and persists throughout the growing season. The injury is found on spur leaves and/or current season growth, and on terminal growth the basal leaves are the first to be affected. In case of slight injury, only a few of the serrations on a leaf will be yellowed. More severe damage may be expressed by interveinal yellowing extending from leaf margins. Late in the season, necrotic areas develop on the leaf margins and the margins may become tattered.

Several researchers have reported that fruit trees are quite tolerant to dichlobenil and it has been used successfully in nurseries

and in established plantings of non-bearing and bearing trees. In some of these trials dichlobenil applications, 4 to 7 1/2 times the recommended rate of 4 lbs. of active ingredient per acre caused no injury to young trees.

In spite of the reported tolerance, symptoms of dichlobenil injury in grower orchards are frequent, especially when dichlobenil is applied with a hand-operated or tractor-mounted spreader. We also have experienced this difficulty in 1967, at our Horticultural Research Center, where dichlobenil was applied with a hand-operated spreader under plum, peach and cherry trees. Phytotoxicity symptoms were very prevalent on plum trees during the summer of 1968, and again in 1969, although no further treatments were applied. Cherry trees also exhibited injury symptoms in 1968 and 1969, but symptoms were almost non-existent in peaches in either year. There are many variables such as rate of application, weather, soil type, soil climate and soil microorganisms that affect the rate of loss or inactivation of herbicides in soil. Nevertheless, the presence of injury symptoms in grower orchards and in our trials has raised questions as to tolerance of fruit trees to dichlobenil and if the injury is harmful to the trees.

****

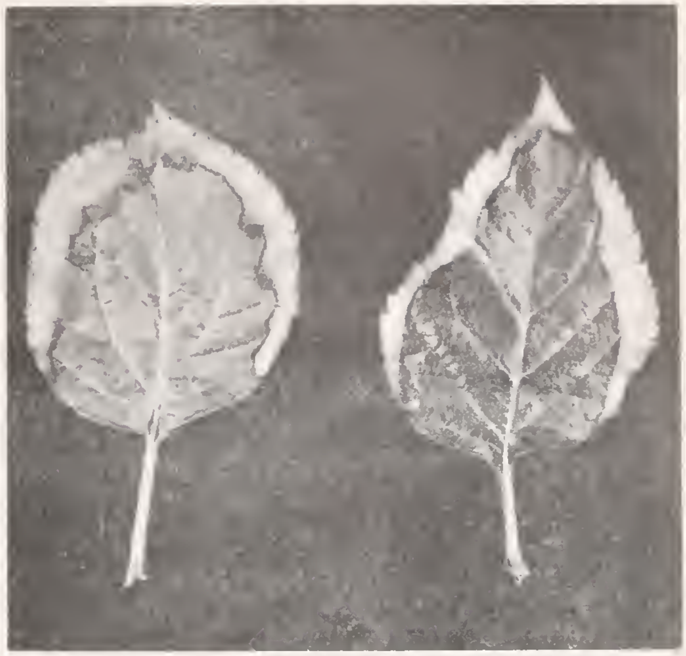


Fig. 2. Dalapon injury on EM VII leaves. The marginal necrosis which is the distinguishing symptom of dalapon injury can be noted.

Fig. 3. Dichlobenil injury on McIntosh apple leaves. The yellowing which is the distinguishing symptom of dichlobenil injury can be noted. The leaf on the leaf shows more severe injury - marginal necrosis and interveinal yellowing.

THE INFLUENCE OF REDUCED DOSAGE RATES OF ALAR ON 'McINTOSH' APPLE TREES

David Shearer
Colrain, Massachusetts

[This article is part of a senior project report submitted by David Shearer, a recent graduate of the Department of Plant and Soil Sciences, University of Massachusetts, Amherst.]

Alar, a growth retardant, has many important and valuable applications in fruit production. Applications of Alar at concentrations from 1000 to 4000 ppm have given outstanding preharvest drop control and, at the same time, delayed fruit flesh softening. However, possible carry-over effects such as increased bloom and fruit set, reduced fruit size and biennial production, are problems of concern. The answer to these problems may lie in the use of reduced dosages of Alar.

To determine the influence of less than recommended application rates on fruit size, fruit flesh firmness and preharvest drop, a study was initiated in the Shearer Orchards, Colrain, Massachusetts, in the summer of 1969. Twenty-four vigorous 20-year-old 'McIntosh' trees were selected for this study. Six replications of the following Alar treatments were established: A) No Alar (check); B) 500 ppm; C) 750 ppm; and D) 1000 ppm. Thirty apples on each tree were tagged and measured on August 1, and again on September 9, to determine the effects of these treatments on fruit size. The Alar treatments were applied on August 7, with a hydraulic sprayer and handgun. As harvest approached, the drops were picked up and counted twice a week for 2 weeks. At harvest on October 4, the total yields were recorded and ten apples per tree were pressure-tested to determine fruit firmness.

Findings of the Study

While other researchers have shown that high concentrations of Alar may reduce 'McIntosh' fruit size when applied from mid-July to mid-August, it is apparent in Table 1, that 500, 750 and 1000 ppm of this growth retardant had no influence on fruit size.

Table 1. Effect of Alar on fruit size of 'McIntosh' apples.

Alar treatment (ppm)[1]	Fruit diameter (in.) 8/1	Fruit diameter (in.) 9/13	Increase
A. 0	2.01	2.67	0.66
B. 500	1.97	2.63	0.66
C. 750	2.02	2.64	0.62
D. 1000	1.98	2.61	0.63

[1] Six trees per treatment.

One of the outstanding features of Alar is its consistent ability to prevent preharvest drop. Even at the reduced concentrations used in this study, drop control was excellent (Table 2).

Table 2. Effect of Alar on the preharvest drop of 'McIntosh' apples.

Alar treatment (ppm)[1]	Total yield (bu.)	Total drop (bu.)	Preharvest Drop (%)
A. 0	102	40.3	39.4
B. 500	125	8.1	6.5
C. 750	133	4.7	3.7
D. 1000	120	5.7	4.9

[1] Six trees per treatment, applied August 7.

Alar, while controlling drop at these lower concentrations also had an effect on fruit firmness (Table 3.).

Table 3. Effect of Alar on flesh firmness of 'McIntosh' apples.

Alar treatment (ppm)[1]	Firmness (lbs.)[2]
A. 0	11.9
B. 500	14.7
C. 750	14.8
D. 1000	15.4

[1]Six trees per treatment, applied August 7.

[2]Average firmness of 10 apples per tree 4 days after harvest.

Summary

Increased yearly use of Alar by commercial fruit growers may create problems related to carry-over effects. Reduced concentrations, if effective, may minimize these problems. This study showed that 500, 750 and 1000 ppm provided good drop control through October 4 and delayed fruit flesh softening. The commercial grower may be able to use Alar at concentrations of 500-750 ppm (2-3 pounds per acre) on at least a part of his orchard and thus reduce the possible hazards and costs involved in using this growth retardant. Findings by Southwick and Lord (1) showed, however, that 1000-2000 ppm Alar may be required for suitable drop control for periods longer than in the present study (2 weeks).

Literature Cited

Southwick, F.W., and W.J. Lord. 1970. Some seasonal and residual responses of McIntosh apples to successive annual applications of Alar. _76th Ann. Meeting Mass. Fruit Growers Assoc_. 76:110-119.

Cooperative Extension Service
University of Massachusetts
Amherst, Massachusetts
A. A. Spielman
Director
Cooperative Agricultural Extension Work
Acts of May 8 and June 30, 1914
—
Official Business
533 — 7/70 — 1000
Permit No. 1216

Postage and Fees Paid
United States Department of Agricultu

FRUIT NOTES

Prepared by the Department of Plant and Soil Sciences
Cooperative Extension Service
College of Agriculture
University of Massachusetts, Amherst

EDITORS

W. J. LORD AND W. J. BRAMLAGE

SEPTEMBER—OCTOBER, 1970

TABLE OF CONTENTS

Issued by the Cooperative Extension Service, A. A. Spielman, Dean and Director, in furtherance of the Acts of May 8 and June 30, 1914; University of Massachusetts, United States Department of Agriculture and County Extension Services cooperating.

HARVEST REMINDERS

William J. Bramlage
Department of Plant and Soil Sciences

With the arrival of the busiest part of the harvest season, fruit growers enter a critical stage of the year. Conditions and events occurring now can be decisive factors in determining the quality of fruit that will be marketed. These critical factors include 1) the weather conditions during the harvest season; 2) the maturity of the fruit when harvested; 3) the carefulness with which fruit is harvested, handled, and stored. Some of the ways these factors influence postharvest life are as follows.

Weather conditions: The weather that shortly precedes harvest of apples can have many effects on fruit quality. Hot weather during this time is generally detrimental. It matures fruit rapidly, accentuates labor problems by shortening the harvest period and almost always leads to increased fruit drop losses as well as to harvest of overmature fruit. It also leads to poorer coloring of fruit since high temperature, especially at night, is not favorable for the formation of the red pigments in the fruit. Furthermore, high temperatures prior to harvest in some way make apples more susceptible to scald. In years with hot harvest seasons, greater care must be taken in applying scald inhibitors, as the need for them will be greater. Even so, the grower can expect higher losses from scald during and following storage, especially with such sensitive cultivars as Cortland and Rome.

If the weather is cool during harvest time, the prospects for high quality fruit are considerably better. There are dangers here too, however. Prolonged cool temperature may delay maturation excessively, so that much fruit is still in the orchard well into October. The use of Alar accentuates this danger. As we saw last year, an early freeze can be disastrous. If fruit are frozen, a whole set of difficult questions arise. How badly are they damaged? Will they recover? How should they be handled? Last year demonstrated how few answers we have to these questions. The problems associated with freezing of apples have been recently discussed by Dr. R.M. Smock of Cornell University (1970 Proceedings, New York State Hort. Society: 199-203). His conclusions were that it is very difficult to predict the consequences of freezing; fruit should not be picked while still frozen; recovery is probably better on the tree than off the tree; and frozen fruit should be disposed of as quickly as possible.

Fruit maturity: Maturity is the stage of development of the fruit at harvest. If too immature at harvest, fruit will never develop top quality flavor or color and will be highly susceptible to shriveling, scald, and brown core after harvest. If overmature at harvest, fruit will age quickly and will be highly susceptible to internal breakdowns and rot after harvest. How do you identify maturity? Pressure test, color (especially undercolor), abscission,

and flavor are helpful guides, but experience with your own fruit is probably your best measure. Use of Stop-drop chemicals can definitely influence maturity; the hormone types will advance maturity while delaying abscission, but Alar will delay maturity as it delays abscission.

An important maturity problem has been introduced with the selection of red sports, especially of Delicious. The greater red coloration brings a temptation to harvest at a more immature stage, with resulting poor quality. When are these red sports actually mature? Several years of intense research at the University of West Virginia have shown that the red sports of Delicious vary greatly, with perhaps as much as 30 days difference in date of maturity among different sports. This research has shown that for the Delicious sports, soluble solids content (primarily sugar) is a good measure of maturity: 10-11% soluble solids, measured by squeezing a drop of juice onto a simple hand refractometer, has been found in fruit with the best long-storage qualities. Our own observations in Massachusetts have been that for Delicious, the intensity of watercore development is a good guide as to whether or not the fruit are overmature (Mass. Extension Service Publ. No. 11, 1967).

It is wise to use immature or overmature fruit for quick disposal only. For storage, use only fruit of approximately optimum maturity if you wish to avoid serious problems and sizeable losses. Storage will not overcome maturity problems, it will only accentuate them.

<u>Carefulness of harvest, handling and storage</u>: Growers hardly need reminding of the dangers from rough handling---bruises, cuts and stem punctures. But labor does need constant reminding. Injuries to fruit can be prevented but cannot be cured.

Growers do need reminding of the postharvest needs of the fruit, however. The urgencies of getting fruit harvested can obscure these postharvest needs, which if not met can cause serious losses later. Cool the fruit as quickly as possible. They are quickly changing, physically and chemically, at harvest. At 85°F, they are changing more than 10 times as fast as at 32°F. The sooner they can be brought to storage temperature, the more "life" will be retained in the fruit.

Be concerned about the temperature at which your storage is kept. As we have pointed out a number of times in the past, if 32° is the recommended storage temperature do not store at 34-35° thinking that the difference is not important. It is important, especially in terms of softening.

Be concerned about humidity in storage. During cooling, relative humidity of the atmosphere will increase if moisture content of the air remains constant. Therefore, saturation may occur producing condensation which can quickly lead to fruit decay, especially if the fruit are still somewhat warm. On the other hand,

early in storage moisture may quickly disappear from the atmosphere, being absorbed by wood if it was not previously saturated. This can result in significant shrinkage of the fruit. Relative humidity should be maintained at 85-95% during storage in order to minimize both rot and shriveling. Golden Delicious should be stored in perforated polyethylene bags for added protection against moisture loss.

If storing fruit in CA, a grower does not need reminding of the CA laws. He does need reminding to be careful, though. Every year some grower suffers serious and avoidable loss due to defective equipment or carelessness. Equipment should be carefully checked before storing fruit, and any indication of a problem either before or during storage should be carefully checked-out immediately. Do not seal a CA room until the fruit have cooled to storage temperature. As air cools, its volume shrinks and in a tightly sealed room this shrinkage can break seals. Successful CA storage operation requires caution, because mistakes are often extremely costly.

****

PROTECTING PRODUCE FROM MOISTURE LOSS

F.G. Mitchell and R.F. Kasmire
University of California, Davis

(Editors' note: We have in the past urged greater attention to humidity and moisture loss. The following article is reprinted from the December 15, 1969, issue of Perishables Handling, published by the University of California Extension Service, as a review of the problem and of the approaches taken to overcome it.)

Moisture loss is a major cause of deterioration during fresh fruit and vegetable marketing. Serious moisture loss may appear as shriveling of fruit, a wilted and often yellowed appearance of leafy vegetables and a limp, flaccid and often dried appearance of roots and stems. When severe, it can render the product completely unmarketable. These symptoms become subconscious guides to product freshness. It is impossible to estimate the sale losses resulting from this reduced consumer appeal.

Beyond these visual effects, moisture loss indicates a direct loss in weight of saleable product. Visual symptoms are usually not evident until 3 to 5 percent water loss has occurred. Thus, when shrivel is observed, from 60 to 100 pounds of every ton of the original purchase have literally "evaporated into thin air." This weight loss can be much greater in severe cases.

Water is lost by gaseous diffusion of water vapor from the intercellular spaces of the product either through pores (lenticels

or stomates) in the skin, through breaks in the surface tissue or coating, or directly through the waxy coating. Like other gasses, water vapor moves from areas of higher concentration (the saturated atmosphere within the product) to areas of lower concentration (the surrounding air at less than 100% relative humidity). The drier the surrounding air, the faster will be the movement of water vapor from the product. Since warm air can hold much more water vapor than cold air, this moisture loss occurs faster at warmer temperatures.

The rate of water loss is also affected by air movement past the product. In the absence of air movement, water vapor will concentrate at the product surface and slowly diffuse outward, thus creating a moist layer of air around the fruit. With increasing air movement, this water vapor is swept away ever more rapidly.

Water is lost almost constantly from harvest to consumption. The onset of visual shrivel depends entirely on the cumulative water loss that has occurred. Protective practices are designed to slow the rate of water loss. How important these are at any point in the marketing sequence depends on the protection others have already provided. Since past and future handling practices are usually unknown or unpredictable, good management is always the best practice.

Methods of shrivel protection begin in the field and carry on to the housewife. These include:

Temperature. Rapid cooling quickly places the product under an environment that is adaptable to moisture retention. Maintenance of a constant low temperature (as low as the commodity will tolerate) will minimize moisture stress between the product and its environment. Prevention of temperature fluctuations protects the product from periodic increases in moisture stress.

Relative Humidity. A high relative humidity will minimize the gradient in water vapor concentration from the product to the surrounding atmosphere. Many fresh commodities can be successfully held at 90 to 95 percent relative humidity. Problems of increased growth of decay organisms during high relative humidity storage are usually associated with too high a holding temperature.

Air Velocity. The ability to manipulate air velocity during product distribution can aid in reducing moisture loss. A high air velocity is often essential for rapid cooling. However, if continued after cooling, this high air velocity will cause unnecessary moisture loss, even under high relative humidity conditions. Once cooling is completed, the air circulation should be just sufficient to maintain the temperature by sweeping away the heat of respiration and heat leakage into the system.

Product Waxing. Edible waxes are sometimes used to reduce moisture loss by creating a barrier to water vapor passing through the surface of the product. Since the wax barrier must not interfere with the exchange of O_2 and CO_2 gasses that is essential for

continued life and health of the product, its efficiency in reducing moisture loss must be compromised.

Package Barriers. Polyethylene liners or curtains and wax coated containers are widely used to reduce moisture loss. These have the advantage of providing continuing protection throughout distribution. While poly liners must be vented for gas exchange, they still provide a virtually saturated atmosphere within the container. Poly curtains and wax coated containers create a somewhat lower relative humidity within the container. This is desirable for some commodities, especially if the maintenance of constant low temperatures during distribution is questionable. Such barriers effectively prevent the onset of shrivel during the marketing of a number of fruits. Certain films used in consumer packaging of produce can also provide effective moisture barriers.

Precautions. The handling requirements of the particular commodity should be thoroughly understood. Consult a reliable reference when necessary. In managing the product to avoid moisture loss, other problems must not be aggravated. High relative humidity conditions must be accompanied by low holding temperatures to avoid intensifying rot problems. Either the management of air velocity, or the use of moisture barriers must not slow the cooling of the product beyond safe limits. The use of waxes or package barriers must not reduce gas exchange to a level that cannot be tolerated by the product.

Slowing moisture loss may reduce product deterioration during marketing. If moisture loss has been the limiting factor, then the market life of the commodity may be prolonged. However, protection from moisture loss should be viewed as one aspect of good product management, and used primarily to maintain appearance and reduce losses during the normal marketing.

****

POMOLOGICAL PARAGRAPH

Hot spiced cider: Interest was expressed in the recipe for hot spiced cider used by Bill and Jane Eyssen, Mapleside Farms, Brunswick, Ohio. The recipe is as follows:

HOT SPICED CIDER

To 1 Gal. Mapleside Sweet Cider
Add:

3 Tbls. Honey
12 Whole Cloves
1 Cinnamon Stick
1/2 Lemon Sliced

Simmer 10 minutes

****

INTEGRATED CONTROL AS AN IMPROVED METHOD OF REDUCING PEST POPULATIONS ON APPLES

Gary L. Jensen
Department of Entomology

The newspapers and other news media are replete with reports, discussions and comments concerning the "hard" pesticide problem and the contamination of our environment with such pesticides. The fruit growers and other producers of food and fiber for the nation and the world are placed in rather a precarious position by demands placed upon them by our society. On the one hand the public demands the curtailment of certain much-needed pesticides which allegedly contaminate the environment, and on the other hand the consumers, the same people who advocate the non-usage of these pesticides, demand undamaged and insect-free products. The housewife of yesteryear thought little of an occasional wormy apple, but modern thought and laws prohibit the contamination of foods by insects, mites and other arthropods. It is not presently possible to produce uncontaminated foods without utilizing chemical controls. Despite its many deficiencies, chemical control remains the backbone of insect control, and will continue in this role for the immediate future.

There are other important methods which can be utilized in reducing the amount of chemicals for these purposes, however, and a more adequate knowledge of these methods will enable us to manipulate them so as to manage pest populations and maintain them at sub-economic levels with a minimum of pesticide usage. One very important method of controlling pest populations is the utilization of natural enemies. This method, however, is often not wholly compatible with chemical control. Numerous well documented instances of minor pests emerging as major pests through the usage of chemical controls can be cited. The elimination of the natural enemies of these minor pests in such instances is generally blamed for the resurgence of the pest population.

A greater knowledge of the selectivity and persistence of pesticides is needed. Too often a broad spectrum, persistent pesticide is used when a narrow spectrum non-persistent pesticide could be substituted, or perhaps a proper evaluation of the situation may indicate that a chemical treatment may be postponed or eliminated altogether. Natural enemies too often are not given a chance to do their job. Growers are understandably eager to utilize pesticides for pest control inasmuch as they are relatively cheap, quick and thorough in their control. However, natural enemies if given a chance have in many instances proven to be a cheaper more permanent type of control. Natural enemies do not leave residues, and are highly selective and self-perpetuating. Their main liability is that they are slower to give the desired level of control. Often a high pest population level is needed before the natural enemies can become effective, in which case this approach may not be feasible; however, if given a chance to work in the absence of chemical

pesticides or in the presence of less harmful selective pesticides, the natural enemies may in time lower the pest population to a subeconomic level.

A very real and important part of pest control should be a knowledge of the economic injury level or economic threshold of pest populations under a variety of conditions and in different areas. Such a knowledge would help to determine whether or not treatment is necessary and when it becomes necessary. In the absence of this information, growers are often forced to use prophylactic treatments as an insurance measure against pest populations. This approach while effective on a short-term basis leaves much to be desired. Insect and mite populations in particular have remarkable adaptability, and in time they usually become resistant to these temporary measures. This necessitates the use of alternate chemicals or some other method of control. Too often growers increase the pesticide dosage several fold. We need to have alternate methods perfected in advance of the occurrence of this phenomenon of resistance. The use of natural enemies is one logical alternative, and could be used simultaneously with chemical control if the chemicals were highly selective for the pest populations, and/or if the chemicals were applied in a manner that would be innocuous to the beneficial insects, that is, as a systemic or at a time when the beneficial insects are not present, or present in only small numbers, or in a resistant state, etc.

Other methods that could possibly be intergrated are the use of resistant varieties, cultural controls such as pruning and mowing techniques, and other modifications of the insect environment that may shift the balance in favor of the natural enemies.

Integrated control programs require a high level of scientific competence. However, the first steps toward integrated control on apples are being worked out and much work is presently being done in Washington, Pennsylvania, Nova Scotia and other areas.

Previous work and present outlook. Early workers on apple pests in New England recommended certain cultural controls which later became impractical with the advent of the synthetic organic pesticides. Such practices were recommendations dealing with clean culture to eliminate overwintering sites of apple pests, cultivation under the apple trees to kill plum curculio and apple maggot larvae, gathering and disposing of apple drops to eliminate apple maggot and plum curculio larvae from completing their development, and allowing pigs or sheep to graze under the trees to eat the infested apples. Modern pesticides and the high cost of labor have made many of these practices impractical, and hence they have been abandoned. An integrated control program could make several of them practical again, however, inasmuch as a reduced spray schedule, use of chemicals harmless to mammals and beneficial insects and clean cultural practices are essential parts of integrated control programs.

Dormant oils have been found to be effective mite controls if applied properly. Since they are effective against the overwintering mite and aphid eggs, they should be an effective part of an integrated control program.

In Canada, work was conducted to determine the fluctuations of herbivorous and predator mites in apple orchards during 1955-1957. It was found that herbivorous mites were more numerous in plots treated only with fungicides than in plots treated with insecticides and fungicides. The predators were found to be inversely proportional to the herbivorous mites in the latter plots.

It is well known that in most apple growing areas of the world herbivorous mites will remain below an economic level unless spray materials are used that are toxic to natural enemies. With this in mind, certain workers proceeded to investigate the effects of a number of spray chemicals on the predaceous mites in Nova Scotia apple orchards. They were able to show that certain spray materials were harmless to beneficial insects and predaceous mites, while others were harmful. A comparison of orchards treated with innocuous pesticides showed a much lower level of herbivorous mites and overwintering eggs than in either the untreated check, or the orchards treated with the harmful materials. The untreated check had a high initial population of herbivorous mites, but the natural enemies soon reduced this number well below the numbers found in the orchards treated with broad spectrum pesticides.

In Washington, workers found a similar situation, in which predaceous mites were able to survive applications of several insecticides, fungicides, and horticultural sprays used on apples. They were able to establish a program which integrated the chemical control of insects with the biological control of mites by selecting chemicals which conserved the predatory mites and by altering spray practices (dosages, timing and method of application). Workers in Japan found that an integrated control program on apple pests also worked for reducing pest populations, especially during the latter part of the season, due to the conservation of predator complexes.

The effects of applications of microbial preparations together with sublethal insecticide doses on insect populations has also been investigated. Such a combination was found to be very effective. The pest population density was not only decreased, but its rate of reproduction and the survival of its progeny were also reduced.

The experimental miticide Plictran was found to control the European red mite on apples and pears in Italy without adversely affecting an important predator, hence a reduction in the number of spray applications could be used since the predators were not interfered with.

An integrated control program in Swiss orchards over a 6-year period permitted a reduction of about half of the insecticide and acaracide treatments normally needed in a chemical spray program.

In California and Chile, the use of portable light traps to detect early season codling moth overwintering brood emergence, enabled workers to reduce the chemical control treatments from 4 to 2 by improving the timings of the treatments.

Not all of these methods will be successful in New England orchards, but it is certain that growers will in the not too distant future be well advised to utilize other methods together with chemical controls to combat the pests in their orchards.

Presently, work is being conducted at the University of Massachusetts orchard at Belchertown and elsewhere to determine what natural enemies are present, which spray materials are available and feasible for an integrated control program, and whether or not certain spraying practices will aid in establishing an effective integrated control program in this area. Other aspects of integrated control will be investigated in the near future.

****

TEST OF A NEW FORMULATION OF 'STOP SCALD'*

William J. Bramlage
Department of Plant and Soil Sciences

'Stop Scald'*, a scald-inhibiting chemical recommended for some cultivars of apples** and produced by Monsanto Chemical Company, will likely undergo a formulation change soon, incorporating a new emulsifying agent. Last season, we conducted a trial of the new formulation in comparison with the one that has been in use to determine if the change would influence scald inhibition or fruit injury.

Samples of Cortland, Delicious, Spy, Baldwin, Golden Delicious, and Rome apples and Anjou pears were dipped in 2700 ppm solution of either the new or the old formulation. The fruit, along with similar samples not dipped, was then stored in 32° air for 5 months, brought to room temperature (70°F) for 7 days, and then examined for scald injury, and decay.

No scald developed on Spy or Golden Delicious apples whether dipped or not. Both formulations of Stop-Scald reduced scald with remarkable similarity on Delicious, Baldwin, and Rome apples and on Anjou pears, but neither reduced scald on Cortland apples (which had been harvested nearly 6 weeks prior to dipping and were probably already induced to scald before being treated). There was no

---

*Trade name
**A scald control recommendation leaflet, revised for 1970, is available from Massachusetts County Extension offices.

evidence of injury to the fruit from either formulation applied at this rate. Dipping had no effect on decay of any apple cultivar, but dipping substantially increased decay of pears regardless of formulation.

In this test, it seemed apparent that the change in formulation of 'Stop Scald' would have no influence on the scald-inhibiting activity of this chemical.

****

Cooperative Extension Service
University of Massachusetts
Amherst, Massachusetts
A. A. Spielman
Director
Cooperative Agricultural Extension Work
Acts of May 8 and June 30, 1914

Official Business

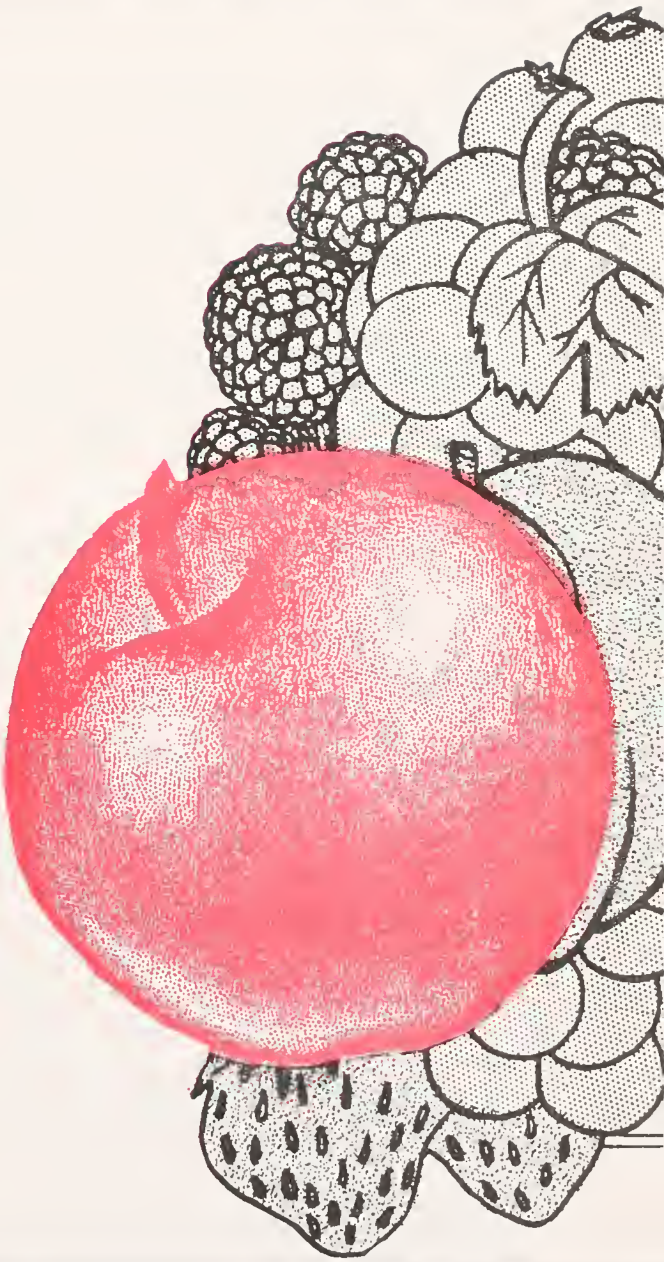
Postage and Fees Paid
United States Department of Agriculture

FRUIT NOTES

Prepared by the Department of Plant and Soil Sciences
Cooperative Extension Service
College of Agriculture
University of Massachusetts, Amherst

EDITORS

W. J. LORD AND W. J. BRAMLAGE



NOVEMBER–DECEMBER 1970

TABLE OF CONTENTS

Issued by the Cooperative Extension Service, A. A. Spielman, Dean and Director, in furtherance of the Acts of May 8 and June 30, 1914; University of Massachusetts, United States Department of Agriculture and County Extension Services cooperating.

NEW ENGLAND FRUIT MEETINGS AND TRADE SHOW

The New England Fruit Meetings and Trade Show will be held at the New Hampshire Highway Hotel, Concord, New Hampshire. The meetings are scheduled for January 6 and 7, 1971.

The hotel is accessible from all major highways. Routes 3 and 93, which lead to Concord, are accessible from anywhere in Massachusetts. Persons coming from Western Massachusetts and Southern Vermont may find the most convenient route to be Routes 9 or 10 to Keene, New Hampshire, and then Routes 9, 202, 89 and 93 to the Highway Hotel.

****

PESTICIDE SAFETY IS YOUR BUSINESS

C.J. Gilgut
Department of Plant Pathology

The ban on the use of DDT for control of pests of agricultural crops may save an occasional bird, but it has already killed some people, according to a news release by USDA on September 4, 1970.

Here it is,

"USDA Urges Caution in Use of Some DDT Substitutes:"

"The U. S. Department of Agriculture today warned farmers and other pesticide users across the Nation to take extra precaution when using some of the more toxic chemical alternatives to DDT for protection of crops and other resources from pests.

The Department is currently investigating a number of accidental human poisonings in North Carolina and elsewhere apparently resulting from misuse of parathion, non-persistent but highly toxic insecticide. Preliminary findings of USDA investigators indicate that in most cases the North Carolina poisonings can be attributed to improper handling or misuse of products containing parathion. Thus far, four deaths and an undetermined number of illnesses have been blamed on the chemical in the State's tobacco growing areas.

In contrast to DDT and other persistent chlorinated hydrocarbons which are relatively safe to handlers, parathion and a few of the other organic phosphate insecticides are highly toxic and may cause injury or even death through skin absorption or vapor inhalation if label precautions are ignored. Because of the risks involved in its handling, parathion has never been registered by the Department for use around the home.

In one case where a 16-year-old North Carolina youth died, investigators reported that he had apparently entered a tobacco field the day after it had been treated with parathion despite label warnings that such fields should not be entered until five days after treatment.

In another instance involving the death of a young boy, tests revealed significant concentrations of parathion and endosulfan residues in an automobile trunk where a product containing these compounds had been spilled and then washed out. Chemical residues also were found on the soil in the lawn area where the car trunk had been washed out five weeks earlier. Shortly before his death, the boy had played barefoot in this lawn area. However, clinical tests have not confirmed the specific cause of death.

One of the other deaths was a suicide and the fourth allegedly was due to a break in a spray hose.

The U. S. Department of Agriculture is carefully reviewing the accident history of parathion to determine if the present labeling requirements are adequate. The Department is also meeting with state officials and other groups in order to fully evaluate the hazards of parathion use and to consider ways of restricting these uses if necessary to prevent injury to people."

We repeat! Pesticide safety is your business. Know the pesticide you use. Read the label and follow all safety precautions and suggestions. Tragedies will only bring on more and more pesticide use restrictions.

****

DANGERS INVOLVED IN HANDLING PESTICIDES AND DISPOSING OF "EMPTY" CONTAINERS[1]

A. VanVranken DesForges, Professor of Civil and Environmental Engineering, Union College, Schenectady, N.Y.

I. Storage of Pesticides: Grower storage facilities for pesticides vary much more widely than do those of distributors or dealers. Many growers now have far less of a storage problem than was formerly the case, as they tend to buy from "spray to spray," thereby letting the distributor or dealer do their long term, heavy storing for them. Nevertheless, there are still many grower storage problems. These include trying to meet the basic specifications of ventilation, dryness, temperature control, proximity of water, light, isolation and security. Few achieve all of these qualifications for a safe storage.

---

[1] Excerpts of an address delivered by VanVranken DesForges before the New York State Horticultural Society in 1969. Printed with his permission.

Several grower storages recently observed had varying quantities of surplus---left-over, replaced by improved materials, and antiquated pesticides. The largest stock of this kind probably comprising several tons - including considerable toxic and persistent material - was stored in a well ventilated, upstairs loft of the packing house. It was reached by a built-in wall ladder with an overhead door equipped with a padlock which was not locked! The grower was concerned with the responsibility of keeping "that stuff" but did not know what to do with it. Further, while realizing that much of it was probably worthless, he did not like to destroy so large an investment! The local landfill was small and of an unimproved type which could not properly handle toxic and persistent materials of this magnitude. We suggested contacting the formulator to see if he would accept the material for detoxification and disposition.

One storage shed with doors open on both sides of the small building disclosed chlorinated hydrocarbons (DDT and Endrin) and phosphates (TEPP and Parathion) subject to rain and easily accessible to animals and children, several of whom were playing in a nearby yard. Also, this open pesticide shed was only twenty odd feet from the open door of a large barn where cows were feeding.

A fire on a grower's premises destroyed a building where pesticides were normally stored. The ensuing year's pesticide supply was stored in another building where the field workers ate their lunch. For some unaccountable reason, probably communication failure, the owner was horrified to find the help still eating their lunch in the same building and using the pesticides, some of which were very toxic, as a back rest!

These incidents accentuate the need for a small separate storage building. Plan EX 5966P, Storage Shed for Pesticides, was recently received from Dr. James E. Dewey, Extension Program Leader, Chemicals-Pesticides, Cornell University. This plan covers a relatively simple and effective storage shed. Of particular value are the following instructions supporting the plan:

A. Separate from livestock, forage and feed storage.

B. Situate so that water from storage area will not drain into or through pasture or lots where cattle, poultry or other livestock might feed.

C. Situate so that water from storage area will not drain into streams or ponds.

D. Stone fill at base is desirable as sump to trap any leakage from spilled or broken containers.

Adhering to these instructions would alleviate many of the problems encountered in the grower storages visited.

II. Surplus Material and "Empty" Container Disposal: Considerable research has been and continues to be conducted on this most perplexing aspect of pesticides and an increasing amount of written material on the subject is available. In spite of these efforts, no satisfactory means of disposal appears to be either generally agreed upon by the foremost authorities on the subject nor are those means conceded to be least undesirable generally known or readily available to all concerned.

The following updated quotations seem pertinent to this problem:

"...Practically all agricultural pesticides are toxic materials and therefore pose a problem from the point of view of disposal in a manner which will not offer a hazard to other biological forms in the environment and contaminate water in soil. In addition, some of the pesticides, particularly the chlorinated hydrocarbon insecticides, are stable and have ability to accumulate in organisms. Therefore, even very low levels in the water or soil may be accumulated by the organism and then when it is consumed by larger forms the quantities accumulate in increasing multiples. Disposal of these materials in landfills has been one of the suggested means; however, the hazard of ground water and water contamination must be considered. Pesticide residues move slowly downward[1] in a soil profile! At the present time, (September 1968) there are really no good practical means of disposal other than high temperature combustion. At the present time I know of <u>only four such thermal units in the United States</u>[2] that are equipped to operate at the temperature required and with the necessary scrubbers in the stacks..." James Dewey.

The Cooperative Extension Service, New York State College of Agriculture and Home Economics at Cornell, in their publication the "Cornell Fact Sheet" dated 10/21/66, reported the following:

"A study of the health hazards of discarded pesticide containers was made by Wolfe et al (<u>Arch</u>. <u>Env</u>. <u>Health</u> 3 (5):531) in the Pacific Northwest. They found the so-called "empty" pesticide containers seldom empty. Measurements of the pesticide remaining and its calculated hazard to man was as follows:

---

[1] Also laterally except at the surface in erosion and runoff. This assumes as a criteria, agricultural research and termite control in the use of chlorinated hydrocarbons.

[2] Hooker Chemical Company of Buffalo, New York is the only one in New York State. Dow Chemical Company at Midland, Michigan, one in the lower Mississippi Valley and one reportedly in the Denver, Colorado area, constitute the three remaining plants.

Parathion Remaining in "Empty" Containers

Container No.	Container Type	Amount found-(Gms.Tech) Range	Amount found-(Gms.Tech) Mean	Fatal dose for a 150 lb. man
12	4 lb. paper bags 29% wp	0.25 - 1.20	.60*	.10
22	5 gal. metal drums 45.5% EC	1.25 - 9.48	2.73+	.10

*This amount fatal to 5 or 6 men.
+This amount fatal to 27 men.

"Their studies indicated that strong alkali solutions were not satisfactory for decontaminating 5-gallon metal drums which had contained Parathion. Rinsing each container twice with water removed almost 98% of the total removable Parathion, as estimated by 5 water rinses" (to remove all that reasonably could be removed by this method).

"They recommended that 2 rinsings with water be used as a minimum decontamination for 5-gallon metal drums after their content of pesticide has been removed. Rinse water, of course, should be put in the spray tanks only. In addition, the drums should be made unusable and destroyed by crushing and burying them.

"Analysis of air samples taken in the smoke from burning paper bags that had contained 25% wettable Parathion showed the smoke to contain Parathion. The level found was greater than the amount in air samples taken while Parathion sprays were being applied. When burning pesticide containers, keep out of the smoke."

III. Suggestions and Recommendations:

1. High temperature destruction of combustible "empty" pesticide containers seems to offer the best possible solution to our present disposal dilemma. As indicated previously, the only thermal facility of this type in New York State is owned and operated by the Hooker Chemical Company at Buffalo. Current and future research will undoubtedly improve the operation and may increase the number of such units. In the meantime, we appear to have the following alternatives:

a. Continue our indecisive and dangerous methods of haphazard open burning (in most cases), accumulation in out-of-door piles with surface and possible ground water contamination, or in unlocked quarters, burying more or less indiscriminately with its potential pollution implications, or

b. Induce the chemical companies or formulators and dealers to supply water-proof, locked, master containers for storing "empty" containers, involving toxic, persistent, accumulative pesticides. They would be accumulated in this manner until the end of the season, at which time they would be taken to central points - probably distributor or dealer

b. (cont.)
warehouses - for shipment to chemical plants for salvage, detoxification or other disposition, as appropriate. This suggestion may seem"far out" and undoubtedly it would take a bit of persuading, or possibly subsidizing and legislating, but it appears to be the most feasible at the present time.

Further, the amount of such "hot" material carried by most growers at any one time is usually of small enough volume to permit storing it in a water-proof, locked, master container such as mentioned above, and surplus or left-over "hot" pesticides should be similarly stored. Necessary regulations to require this safety measure might be brought to fruition and receive better compliance by all concerned if it were all inclusive for toxic, persistent, accumulative pesticides rather than restrictive for "empty" containers only.

2. As indicated by a preliminary and limited study, the predominant trend to paper and cardboard containers is a most salutory one in nearly all respects. It discourages re-use more than any other material involved, it satisfies the ultimate aim of high temperature destruction, and it will materially reduce cost and ultimately simplify packaging and transportation of "empty" containers to their final place of disposal. Further, one large formulator reported for one county ninety-six percent of his sales packaged in paper and cardboard in twelve different formulations and only four percent packaged in one other material comprising seven different formulations. Standardization is resulting in packaging the exact amount for one spray tank load (usually 500 gallon capacity) thereby saving time, wastage of material with its attendant dangers and reducing exposure of the applicator by obviating the necessity to weigh, measure, and otherwise rehandle the "hot" materials. This tendency to standardize both material and size of packages for commercial users will greatly facilitate future studies of this nature. <u>We commend the leaders of this progressive policy and highly recommend that the entire industry get solidly behind this attempt to help simplify a most complicated aspect of the business and also reduce danger from this source</u>.

3. As previously mentioned Plan EX 5966P, Storage Shed for Pesticides, would provide a vast improvement over most of the premises now being used for storage of pesticides. It seems reasonable that these facilities, so important to health and well-being, should meet certain minimum standards and conform to approved specifications similar to requirements for milk houses for cooling and storing milk. These latter premises are inspected currently and must meet the established standards. Why should not similar precautions be exercised in the conduct of storing pesticides, especially the more dangerous formulations?

4. All pesticide storages should post in conspicuous places properly worded and illustrated warning signs. Such signs should bear skull and cross-bones or other arresting and generally understood illustrations. They should be available in Spanish, French or other foreign languages as well as English to accomodate people of these nationalities who work on or frequent the premises; we found no instances where this is the practice even though the need existed. These signs should be posted both outside and inside the storage. It is suggested that the local health department, agricultural extension service and pesticide distributor representatives work cooperatively to see that this is accomplished.

5. Another important function that might be achieved by cooperative effort would be coordinating the activities of police and fire departments in handling emergencies such as fires and floods involving pesticide storages. Some attempts have been made at securing such protection, but all those involved should get in the act and provide inspection or other follow-up to up-date changes, report on emergencies and generally see that the plan works.

****

EXTENT OF FOOD CONTAMINATION BY 2,4,5-T

Gary L. Jensen
Department of Entomology

From a recent Washington Newsletter of the National Aerial Applicators Association, we have the following information on 2,4,5-T:

"What is the extent of 2,4,5-T contamination of food products reaching the ultimate consumer? Over a two-year period, 1967-1968, more than 24,000 food basket samples were collected by Pesticide Monitoring personnel and the Food and Drug Administration from markets across the United States. Three samples of food items contained 2,4,5-T. The highest level reported was 0.19 ppm in milk fat. Another sample contained 0.008 ppm in milk fat. A meat sample contained .003 ppm of 2,4,5-T. Calculations show that for a 130 pound woman to obtain the amount of 2,4,5-T equivalent to the 21.5 mg/kg which was administered to the mice in the Bionetics study would have to consume 175,000 quarts of milk per day for 9 consecutive days. This would be equivalent to a rate which produced "no effect" in the study on mice."

****

FRUIT NOTES INDEX FOR 1970

(This index of major articles has been prepared for those who keep a file of Fruit Notes. The number in parentheses indicate the pages on which the item appears.)

****

Cooperative Extension Service
University of Massachusetts
Amherst, Massachusetts
A. A. Spielman
Director
Cooperative Agricultural Extension Work
Acts of May 8 and June 30, 1914

Official Business

Postage and Fees Paid
United States Department of Agriculture